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Paris green dusting outfit for mosquito control along 500-mile shoreline of Saluda dam reservoir

St. Louis Subdues the River des Peres

First of four articles on one of the great municipal drainage projects of the day

Also

Reinforced Brickwork in Japan

Equipment for Hydraulic-Fill Levee Construction

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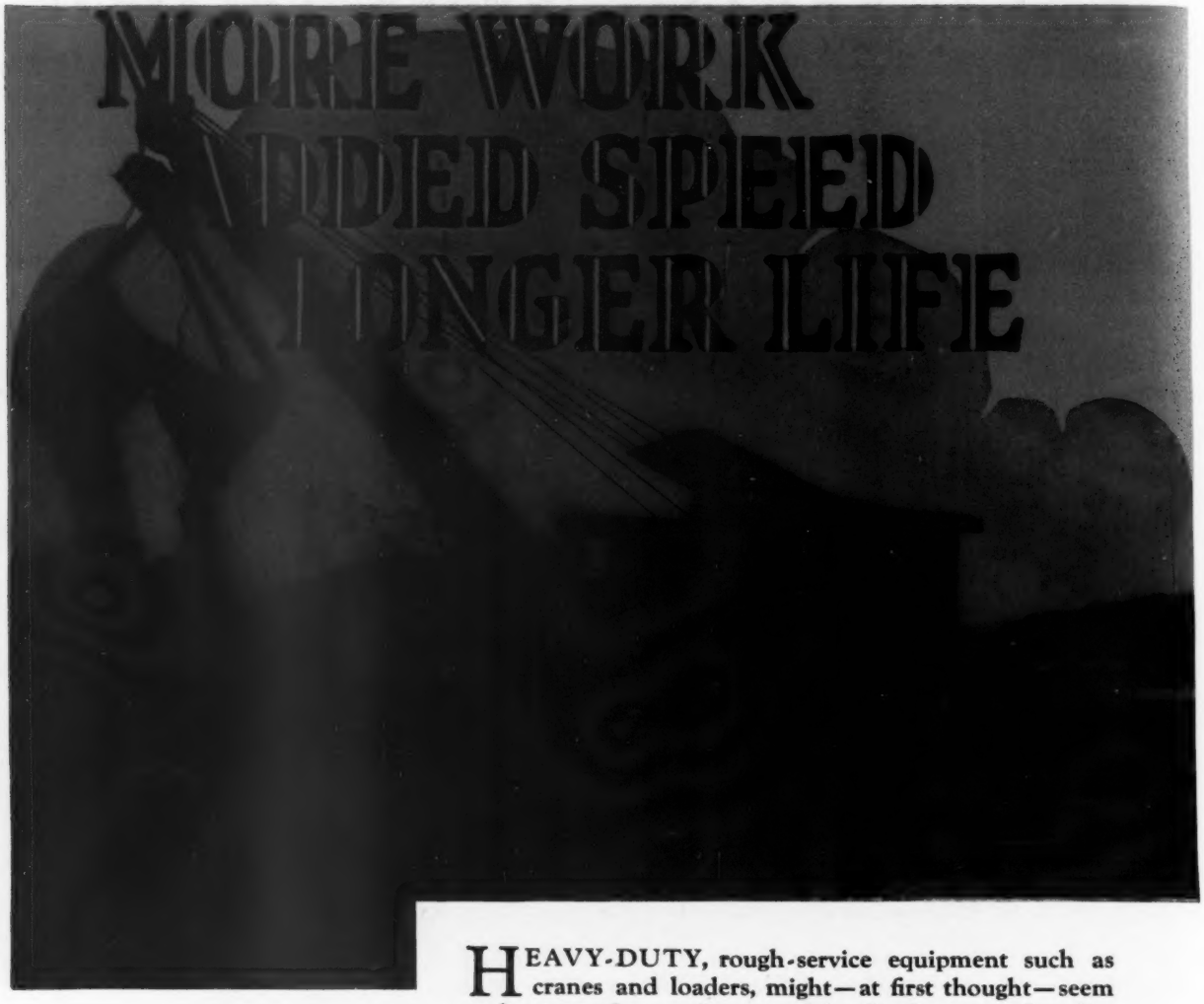

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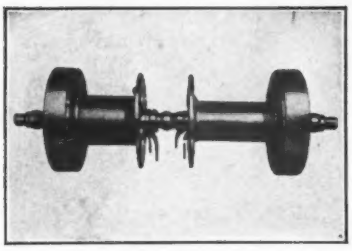

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ENGINEERING NEWS-RECORD

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 105 NEW YORK, JULY 24, 1930 Number 4

A Promising Development

PRACTICAL use of reinforced brickwork appears to have made greater progress in Japan than elsewhere. Dr. S. Kanamori reports a wide range of applications made possible by the production of a notched brick which permits of free placing of reinforcement at right angles to the courses. In conjunction with use of reinforced brickwork elsewhere this development is promising. The Japanese tests show identity of mechanical behavior with reinforced concrete and furnish the quantitative data necessary for design. Many occasions arise in practice where bricklaying is cheaper and more convenient than concrete placement, and here the wall, column, beam or slab of reinforced brickwork has favorable possibilities. It would be helpful if practical trials of the method were made in this country, both to show its service value and to develop the essential details of material and procedure for best results.

Federal Stream Control

EXTENSION of federal control to the entire stream network of the country, large and small, is foreshadowed by the recent opinion of the attorney-general on the scope of the Federal Power Commissions authority. The issue is important, and for this reason a summary of the opinion is published on another page. Heretofore federal control has remained within much narrower limits, fixed by considerations of effect on navigation, which by virtue of the interstate commerce clause of the constitution is under federal jurisdiction. If these limits are now to be broadened, without reference to interstate commerce, far-reaching changes in water administration throughout the length and breadth of the country will result. It is well, for the present, to note that the matter is subject to decision by the supreme court and that the attorney-general's opinion is weakened by the surprising interpretation he gave a year ago of the Mississippi River flood-control act and the President's power thereunder. Actual extension of federal jurisdiction to remote tributaries will no doubt give rise to many battles in court, whether approached by way of power or by way of flood control.

Tunnel Explosions

AN EXPLOSION in the Hetch Hetchy aqueduct tunnel through the Coast Range re-emphasizes with its death toll of twelve the hazard inherent in tunneling through ground which gives out inflammable gas. Such explosions are neither new nor unpreventable. A long series of similar accidents marks the history of tunnel construction in both rock and earth, and a wide variety of causes has been responsible for ignition of the gas in different cases. The net result is to teach the truth that not one safeguard alone but only the most extreme care in every detail throughout the whole operation will protect against the risk. At Hetch Hetchy the presence of gas was known and safety measures were in force, including ventilation, guarding of electric lamps and constant use of mine safety lamps as detectors. The fact that a previous explosion occurred in a near-by section of the rock less than two months ago indicates that the protective system failed somewhere, either in the equipment or in observance of safety rules. Probably the exact cause will never be established in the present case, because of the destruction done by the explosion. But the warning which the accident gives of the need for surpassing watchfulness and care in gassy tunnel drifts is only the more emphatic.

Protection or Penalty?

NEW JERSEY, after only six months of experience with a financial responsibility law for automobilists, has found it advisable to restrict its application drastically. As first put into effect, the law not only required insurance on the part of every motorist involved in an accident but also applied to those violating practically every one of the numerous state automobile regulations. Even such minor offenses as stopping more than six inches from the curb or driving with defective lights subjected the offender to compulsory insurance at a 10 per cent increase in cost over the standard rate. Naturally such a severe law aroused public opposition. A few months of enforcement was enough to reveal its drawbacks; the legislature, at the request of the motor vehicle department, has reduced the number of offenses to which the law applies to only four: manslaughter, driving while intoxicated, running away from an accident, and reckless driving. The requirement in respect to accidents is, of course, retained. Public approval of the revised law is outspoken, indicating that the proper function of insurance is protection, not punishment.

Balancing Economy and Safety

ENGINEERS concerned with structural design recognize that a structure built of more than one material requires consideration of the comparative service strengths of the several materials with a view to fixing design stresses that will produce balanced safety factors throughout the structure. It is less clearly recognized that when a building code is being written the same requirement applies far more imperatively. A single structure is not necessarily endangered or made uneconomical by departure from ideal balance of the stresses in its component materials. The same defect in a building code, however, may result in extensive losses in either

lessened safety or in higher cost of building. Since working stresses established by building codes determine not only safety but also economy of construction, they are a controlling factor in defining the competitive relation of equivalent types of construction, as steel, timber and concrete frame, or stone, brick and block walls. They may thus lead to a cost advantage of one type of construction over another of greater dependability. It is therefore peculiarly important that building-code drafting or revision take full account of those teachings as to the service value of constructional types and materials which only long experience can yield. Tests may be of almost equal value when carried out in direct simulation of practice, as was the case, for example, in the elaborate tests of columns conducted some years ago; but most laboratory tests do not cover all terms of the service equation and therefore cannot be used unless interpreted in the light of well-judged practical experience.

St. Louis Controls a River

STREAMS within cities universally propound costly municipal engineering problems. This is true whether they are great rivers carrying large commerce as are those which intersect the city of Pittsburgh, or that which provides an inland harbor for Chicago, or merely a little artery for local drainage like the River des Peres in St. Louis. The magnitude of the work necessitated by the latter is brought out clearly in a series of four articles beginning in this issue. Similar improvement of small city streams elsewhere has usually had improved sanitation for its main purpose, with continuity of streets and industrial growth as a secondary purpose. In the River des Peres rectification and enlargement operation, these objectives were subordinate to flood protection. Barely worthy of being called a creek in its low-water stages, this stream has in times of flood the possibility of virtually cutting the city off from land communication to the west. It is to eliminate this flood hazard that $11,000,000 is being spent by St. Louis in replacing 18 miles of sinuous creek by 13 miles of covered conduit. The main engineering problem was channel construction, crossing and recrossing a sinuous stream in a valley with groundwater always well above excavation. Stream diversion and groundwater drainage tasks of the first order were presented in almost every section of the channel; their solution and the notably rapid building of large concrete conduits, related by the chief engineer of the work, is a model account of well-studied engineering procedure.

Wind Pressure and Model Tests

FEW structures of great size have been given as much study from the standpoint of wind pressure as the huge Akron airship shed. Following tests on a 5-ft. model, a wind load of 80 lb. per square foot both positive and negative was assumed for the roofing sheets, purlins and rafters. Such an unprecedented value would seem to require some justification by supporting test data, but none is offered. Supplementary tests which the Navy Department is making on the same model are said to constitute the reason. However, this apparent lack of confidence on the part of the Goodyear experimenters in their own test results deprives the engineering profession of data on an important question. Two sets of results of model tests would be much more useful than the combined conclusions of Goodyear and the Navy Department. This is particularly true since model tests have quite obvious limitations in so far as wind action is concerned. General observation shows that storm attack on a large building is not the pressure of a steady stream of air, such as model tests utilize; and artificial simulation of irregular storm actions is hardly feasible, if only because the nature of these actions is largely unknown. It may therefore be questioned whether knowledge of proper wind design can hope for much advance through model tests. Observation of the behavior of structures in storms seems the most promising source of data. Systematized observation by a large group of co-operating agencies could assure the gradual accumulation of quantitative knowledge of storm forces and distribution, of determining value for future design.

Hydraulic-Fill Levee Problems on the Mississippi

HYDRAULIC-DREDGE fill is the only innovation in levee construction methods which has been developed in two years' active work on the new Mississippi flood-protection project. It has established itself in the face of design and specifications predicated on construction by dry fill and of almost revolutionary improvements in equipment for dry excavation and earth moving. Some of the obstacles of design and specifications are indicated in the articles by J. R. Wilbanks in this and a preceding issue. The author, however, does not dwell very fully on the physical obstacles of materials, access by dredges, and the slow precipitation of solids exaggerated by the small settling ponds which narrow levee embankment makes necessary. A study of these factors, in a survey made last fall of the several hydraulic-fill levee operations, indicates that they may well be emphasized somewhat more particularly.

Dredges have been recognized levee construction equipment on the Mississippi only since work became active two years ago on the present enlarged levee project. Their advance to their acknowledged high position as levee-building tools has come about in two years—a remarkably quick accomplishment. Naturally a survey discloses loose ends of practice and unsolved problems.

The first of these is dredge size. There is a preponderance of small dredges, 10- and 12-in. machines. Their choice is based largely on the accepted necessity of getting in close to the levee and operating under borrowpit requirements predicated on dry excavation methods. The process of digging in to location from the river, which often is a locking operation, is simplified by small size of vessel. A more compelling reason in actual fact is that with material going largely into suspension when pumped and with restricted discharge pools, the smaller volume of pumpage to be managed is an advantage. While recognizing the force of the situation, the query arises whether it need exist and whether it is not taking away from the hydraulic dredge its principal advantage as a levee builder.

The dredge has only qualified claim to prime position in building Mississippi levees if it merely constructs the fill as cheaply as dry excavating machinery. Its stronger appeal to the engineer lies in two things: *first*, its ability to take its material from farther afield and so exercise selection, and *second*, its ability to produce a better levee structure than is likely to be had with

dump dry fill. If this distinctive engineering-construction virtue of dredge-fill levee is to be made use of, the large dredge, with its greater capacity and cheaper production, comes more prominently into the picture. It is quite within the bounds of expectation, then, that present dredge sizes are not definitive, despite the absence of large dredges from the regulation levee operations.

Altogether the larger problem of hydraulic-fill levee construction lies in handling and settling the delta soils into levee embankment. The straight sand soils may be dismissed from consideration; they dig and pump easily and settle quickly, seldom less than 80 per cent and more often 90 per cent being retained in fill between dikes. Experimental hydraulic-dredge levee construction in the Memphis engineer district by Major E. C. Kelton indicated that about 70 per cent of buckshot or heavy clay coming out of the discharge in lumps can be retained in the levee section without dikes; the remainder is fine material which remains long in suspension. In sandy loams the clay seems to be cut by the sand and the deposit at the end of the pipe line is very slow. The discharge is like a thick heavy soup which dries out slowly, compacts only a little and becomes very impervious.

The significant fact in this citation of delta soil action in hydraulic-dredge fill is the loss of solids. Few dredge operators on the river admit less than 30 per cent waste, and on some operations more than half the solids are estimated to flow over the waste weir. This sets up a difficult problem in discharge-pool practice, and little invention in its solution has been disclosed. Either very long pools are required—with their attendant difficulties of clearing, grubbing, plowing, muck ditching and retaining-dike construction far ahead, long prior to any possible pay estimates—or else large waste over the spillway must be frankly accepted. In pool construction some invention is apparent in the use of pool traverses with staggered sluices to still the current and increase settlement and in the use of Y-pipes discharging right and left into alternately still and active pools, but, as a whole, pool practice presents no solution of the problem of excessive waste.

If large overflow of solids is accepted, the query is: Must these solids be uselessly wasted, or can they be wasted to serve some constructive purpose? The work done by Mr. Wilbanks in utilizing overflowing solids is notable and encourages speculation and research into other useful possibilities of pit filling and impervious blanketing.

With the problems of hydraulic placement there is the equally difficult problem of co-ordinating the wet deposition of the main fill with the dry-fill processes required for dike construction and topping out the embankment. Ordinarily dry-fill operations constitute from 40 to 50 per cent of the earth moved. Their order and co-ordination with hydraulic placement is a problem in earth-moving economics which varies with every levee location. Broadly, the object sought should be to rehandle the least volume possible; however, it is often economy to break this rule. There is large opportunity for shrewd planning in co-ordinating the interlocking operations of wet and dry earth placement in hydraulic-dredge levee building.

The excellent articles of Mr. Wilbanks record interesting development in levee construction methods. A technique of hydraulic-fill construction is being worked out on large scale. There is a multitude of questions which yet have to be answered; not the least important of these is just what quality of levee structure is being obtained. Is it better—more stable and impervious—than the levee being produced by dumped dry fill? Does the hydraulic dredge give us a tool for more perfect levee construction, and if it does, is it being used in a manner which enables us to realize all it has to offer? Final appraisal of hydraulic-fill levee construction depends on answers to these questions.

The Noise Evil Again

EVIDENCE increases that noise is coming to be ranked as an enemy to human comfort and well-being. Washington, the national capital, recently had a flurry of agitation against noises from building operations in the heart of the city. New York about the same time went into one of its periodical spasms of outcry against noise, and the city health commissioner interested himself in the matter sufficiently to ask a committee to study means of reducing unnecessary noise.

The committee in its report just made public cites rivet hammers, power shovels, rock drills, pile hammers, hoisting machinery and motor trucks as outstanding offenders in creating noises. Welding is put forward as one means of eliminating riveting noises. A curb on all construction and demolition work at night in residential sections is suggested in the interest of healthful sleep. A veiled threat that manufacturers and users of construction equipment may soon be faced by public opinion or official mandate to devise effective mufflers is contained in the report. It is plain that the construction industry must soon cease to disregard this trend of the times.

There is little reason to doubt that city dwellers in the large majority are injuriously affected by the never ending din that disturbs both business and residential sections throughout the day, with little relief in the night. The evil is increasing day by day, moreover; what is gained by the silencing of a few factory whistles is more than made up by new noises. What has so far been sporadic irritated protest against noise is about ready to consolidate itself into a systematic campaign. When this becomes well organized, its attack will be directed largely against the engineer and his works—street cars, motor trucks, shovels and concrete mixers, pavement breakers and air hammers. The result will be much inconvenience, some loss and a measure of ill repute for engineers and engineering.

It seems unwise to await the attack; the engineering industries would do well to forestall it by studying noises and working for their reduction before the popular movement acquires momentum. It will be in their own interest as well as that of the community at large. Note how the bus has gained over the pounding and clattering street car, partly by the attraction of its relative noiselessness; how the elevated railway has been put on the shelf of obsolescence because of its deafening clangor; how structural welding has come into a preferred position over the offensive riveting hammer. By the same token the maker of hoists or shovels who aims for smooth, unobstrusive operation as against mere brute power and din may find himself in possession of a persuasive selling point. So also the creator of silent motor trucks may succeed in crowding all competitors from the field. There is quite obvious room for reform, and equally obvious reason to set about it without delay.

Design of River des Peres Drainage Channel, St. Louis, Mo.

Missouri Metropolis Puts Its City-Owned River des Peres in Conduit and Canal at a Cost of Eleven Millions—An Analysis of the Hydraulic Problems and of Wide Single-Arch and Twin-Conduit Construction

By W. W. Horner

Chief Engineer, Sewers and Paving, St. Louis, Mo.

The River des Peres drainage channel now under construction in St. Louis, Mo., is one of the great purely municipal drainage projects of the United States. It will replace 18 miles of natural stream by 13 miles of structure intended to carry the streamflow in a manner consistent with the general standards of sewerage of the city. A bond issue of $11,000,000 was voted in 1923 as a part of the St. Louis $87,000,000 improvement program. Construction was begun early in 1924 and is expected to be completed in 1931.

As it is being built the new river channel will consist of about 7.3 miles of open canal in earth, 1.7 miles of open canal in rock and 4 miles of reinforced-concrete arch conduit. Of the concrete conduit 10,000 ft. will consist of twin arches each 29 ft. wide, and the remainder of single arches 32 ft. wide. The structure and construction methods are described here in four articles covering general plan and design, open canal construction in earth and in rock and reinforced-concrete conduit construction. —Editor.

THE MAIN STEM of the River des Peres became a part of the city of St. Louis when the boundaries of the city were extended in 1876. The river has a drainage basin of 100 square miles (Fig. 1), about 16,000 acres of which are within the city. It presented from the first a serious drainage problem. As the growth of the city extended westward, drainage became more necessary, because the damage from overflow was greater and the stream became increasingly polluted from the sewers which were constructed to empty into it.

Almost constant study was given to the problem through all the years until 1916. Rainfall, runoff, combined and separate sewerage, location, types of structure and many other details were investigated and tentative plans developed. Just before 1912, when the phase of the work which is the subject of this article began, a low-level, intercepting sanitary sewer was constructed alongside the river for about 6 miles from Lindenwood to the Mississippi River (Fig. 2). This sewer increased from 6 ft. to 10 ft. in diameter. It is an essential part of the present plan which will now be considered specifically.

Flood of 1915 and the Resulting 1916 Plan

During the few years following the completion of the intercepting sewer, several high floods occurred in the river. In 1912 two occurred as a result of excessive downpours of one to three hours' duration. In 1913 another flood was recorded as the result of a day's heavy rain. Demands for improvement had already become urgent when St. Louis was visited by the tail-end of a Gulf hurricane in August, 1915. This storm produced a rainfall of more than 10 in. in twenty hours, and the resulting flood was far beyond any of previous record. For nearly 48 hours the city was virtually cut in two by high water, railroad transportation from the west was stopped, major industries were seriously damaged and some loss of life resulted.

After this occurrence it was evident that all that was

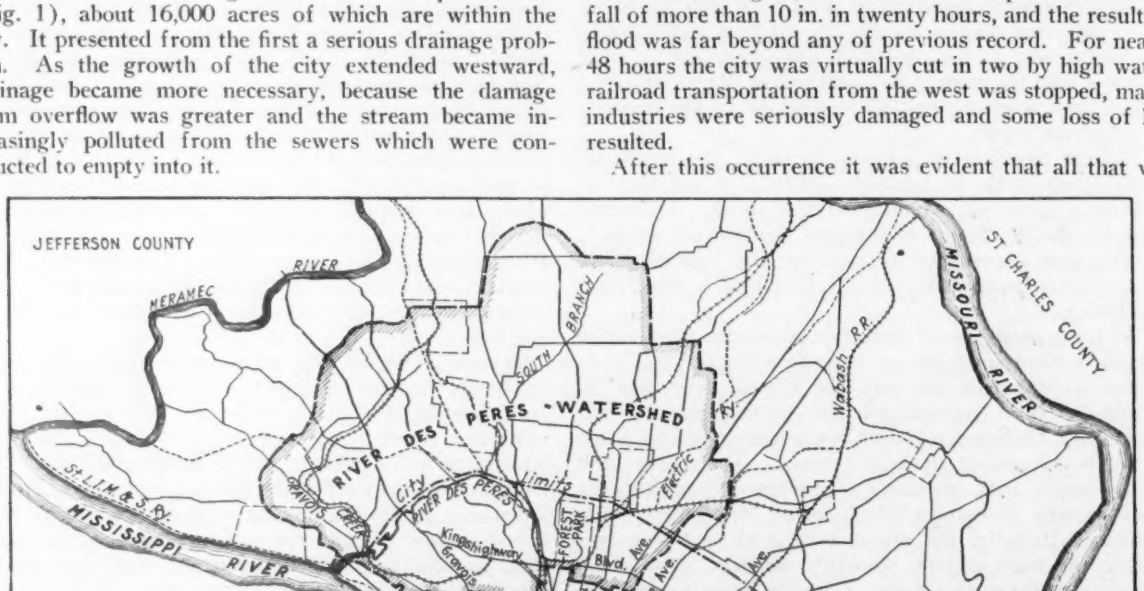


FIG. 1—WATERSHED OF THE RIVER DES PERES AND ITS RELATION TO THE CITY OF ST. LOUIS
This is taken from the 1916 report, and since that time the municipalities in St. Louis County have been greatly extended. Note that the principal drainage from the county area enters the city at three different points.

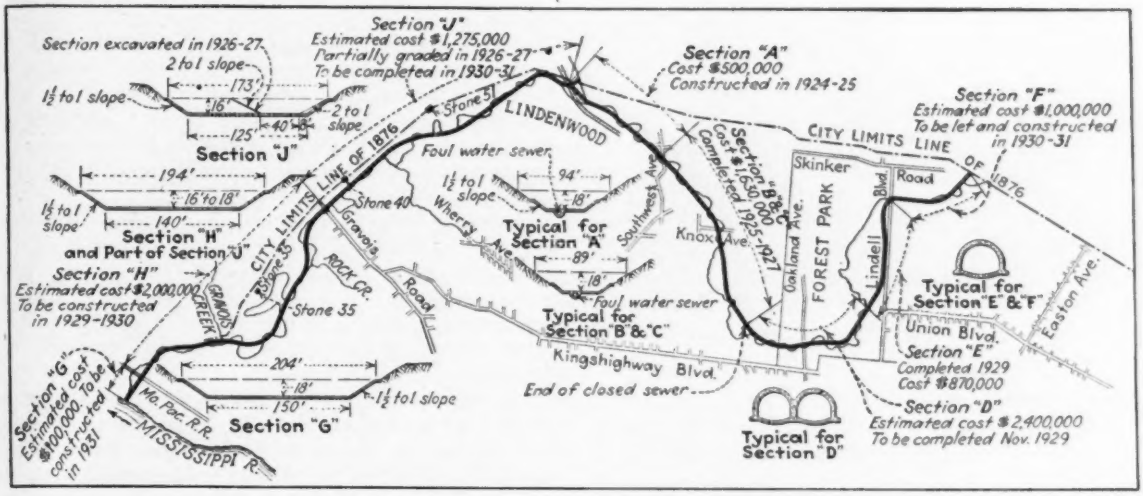


FIG. 2—OUTLINE MAP OF THE RIVER DES PERES DRAINAGE WORKS
Note the sections into which the project was divided, the cost of each division and the various cross-sections indicating the type of channel.

necessary to secure financing was to place a bond issue before the people for vote, and every effort was made immediately by the engineering department to bring the plans up to date. All of the newly available rainfall data were put in condition; other more definite information on rates of runoff, made available by experiments on sewered areas, was tabulated, and a new study of probable rainfall frequencies and floodflows was prepared. As a check on these studies, there were the results of measurements of the floodflows of 1915 and of one or two smaller storms. (See *Engineering News*, September, 1915.) New economic studies were undertaken and a general plan was prepared by the writer and approved by the board of public service in December, 1916.

The provision of funds was put up for vote in 1919, at which time the cost of the project was estimated at $6,500,000. After-war reaction and the feeling against construction in view of the rapidly rising costs resulted in defeat. The project came to the people again in 1923, and although the estimate at that time had been increased to $11,000,000, it was voted and work was started early in 1924. With very little variation the project now being carried out follows the plan of 1916.

General Plan of Drainage

The plan involved the improvement of the stream throughout its full course inside the city limits. The location (Fig. 2) does not follow the existing stream, which has many short loops; in fact, wherever possible the new work was located away from the river to decrease the construction hazards from floodflow.

The design provides for a single reinforced-concrete sewer 32 ft. wide and 25 ft. high, from the city limits for about 2 miles to the middle of Forest Park. At this point large additions of lateral inflow required considerably increased capacity. It was found most economical to secure this by parallel sewers, and a twin structure, each tube 29 ft. wide, is provided for a distance of 2 miles to the point where it was decided to end the completely closed construction. On the map, Fig. 2, the 32-ft. sewer is shown by cross-sections *F* and *E* and the double 29-ft. sewer by cross-section *D*. Details of these sections are shown in Figs. 4 and 5.

At the lower end of section *D* another large drainage area is tributary. At the same time the character of the district changes sharply from park and residential to heavy industrial. The propriety of continuing the closed sewers farther along this reach was considered, but preliminary calculations showed such construction to be economically unsound. Estimates indicated that the adoption of either closed sewers or the retaining-wall section would, on the basis of land saved, require property values of about $90,000 an acre. Even considering all the benefits to adjoining property which might result from the removal of severances and general improvement of the district, it was clear that these types of construction would not be justified on land worth less than $1 a square foot, whereas the prices in this district at that time were appreciably less than 20c. a square foot.

Accordingly the section adopted was open canal with sloping sides, the slopes varying from nearly vertical in hard rock sections to as flat as 1 on 2 in very soft ground. The bottom widths varied from 30 ft. to 150 ft. and the flow depths which were adjusted to fit a final hydraulic gradient were generally 16 or 18 ft. The actual dimensions of these canal sections are shown by Fig. 2, and the capacities are given in Table I.

For the lower 6 miles between Lindenwood and the Mississippi River, a sanitary intercepting sewer had been constructed in 1910. The plan of 1916 involved the extension of this intercepting sewer for an additional 3 miles, or to the lower end of the twin conduits of section *D*.

Capacities of Intercepting Sewers

The capacities of the intercepting sewer were based upon gagings of sewage flows in the existing St. Louis sewers reduced to a per capita basis, with allowance for a considerable amount of groundwater infiltration. Under normal weather conditions, groundwater flow was found to be about 0.0005 cu.ft. per second per acre. Population was figured at 45 per acre for the whole city area and at 6 per acre for the whole country area. The per capita flow was 75 gal. per day over an eighteen-hour period. The resulting allowances amounted to 0.0075 cu.ft. per second per acre for the city and 0.0015 cu.ft. per second per acre for the country. These are average figures.

These calculations were based on the 1909 studies on which the lower 6 miles of the sewer were designed.

TABLE I—HYDRAULIC QUANTITIES FOR THE RIVER DES PERES STORM-WATER SEWER

Line	Areas Tributary to This Line, Acres: County 10 Per Cent Imp.	County 15 Per Cent Imp.	City 30 Per Cent Imp.	City 45 Per Cent Imp.	Total Area, Acres: County 10 Per Cent Imp.	County 15 Per Cent Imp.	City 30 Per Cent Imp.	City 45 Per Cent Imp.	Unit Runoff, Cu.Ft. per Second per Acre: County 10 Per Cent Imp.	County 15 Per Cent Imp.	City 30 Per Cent Imp.	City 45 Per Cent Imp.	Total Runoff, Cu.Ft. per Sec.	Slope, Per Cent	Velocity, Ft. per Sec.	Time, Minutes	Time, Minutes	Length of Section, Ft.	Section. The sides of the open channel are figured on a slope of 1½ to 1. "n" = .013 for closed sewer. "n" = .016 for open channel
City Limits to Clemens Ave.	4,742.0	3,549	1,752	.....	4,742.0	3,549	1,752	.....	0.92	0.96	1.01	.....	9,539	0.13	14.3	1.28	116.0	1,100	32-ft. horse-shoe—A = 665.6 sq.ft.
Clemens Ave. to Kingsbury	.....	.....	339.0	.....	4,742.0	3,549	1,752	339.0	.91	.95	1.00	1.10	9,812	.138	14.7	1.98	117.28	1,750	32-ft. horse-shoe—A = 665.6 sq.ft.
Kingsbury to 700 ft. S. of Lindell Blvd	.....	.....	316.0	.....	4,742.0	3,549	1,752	655.0	.90	.94	.99	1.09	10,052	.142	15.1	2.76	119.26	2,500	32-ft. horse-shoe—A = 665.6 sq.ft.
700 ft. S. of Lindell to Union Blvd.	149.5	.....	50.0	1,062	4,891.5	3,549	2,814	705.0	.90	.93	.98	1.07	11,215	.176	16.8	6.15	122.02	6,200	32-ft. horse-shoe—A = 665.6 sq.ft.
Union to Mouth of Euclid	722.7	.....	1,581.6	.....	5,614.2	3,549	2,814	2,286.6	.86	.90	.94	1.03	13,023	.100	11.9	2.55	128.17	1,820	Double 29-ft. horse-shoe—A = 546.65×2 sq.ft.
Euclid to the Clayton Bridge	134.2	.....	678.4	.....	5,748.4	3,549	2,814	2,965.0	.85	.89	.92	1.02	13,658	.110	12.5	3.37	130.72	2,525	Double 29-ft. horse-shoe—A = 546.65×2 sq.ft.
Clayton Bridge to Macklind Ave.	347.6	.....	.....	.....	6,096.0	3,549	2,814	2,965.0	.84	.87	.90	1.00	13,706	.110	12.5	6.07	134.09	4,555	Double 29-ft. horse-shoe—A = 546.65×2 sq.ft.
Macklind Ave. to Sublette	.....	.....	1,870.9	.....	6,096.0	3,549	2,814	4,835.9	.81	.84	.88	.98	15,134	.100	13.6	1.47	140.16	1,200	35x18-ft. open channel.
Sublette to Knox Ave.	.....	.....	401.0	.....	6,096.0	3,549	2,814	5,236.9	.80	.83	.88	.97	15,379	.100	13.8	3.54	141.63	2,930	35x18-ft. opne channel.
Knox to Queen St.	.....	.....	1,361.9	.....	6,096.0	3,549	2,814	6,598.8	.80	.82	.86	.94	16,410	.116	14.7	6.73	145.17	5,940	35x18-ft. open channel.
Queen St. to Lindenwood	.....	.....	806.3	.....	6,096.0	3,549	2,814	7,405.1	.76	.79	.82	.90	16,410	.116	14.7	6.28	151.90	5,540	35x18-ft. open channel.
Lindenwood to C Lim. Stone 51	14,701.0	4,600	4,462	737.0	20,797.0	8,149	7,276	8,142.1	.73	.75	.79	.88	34,207	.091	14.3	9.67	158.18	8,300	125x16-ft. open channel.
Lim. Stone 51 to Wherry Ave.	2,474.0	.....	775	308.0	23,271.0	8,149	8,051	8,450.1	.68	.71	.73	.83	34,500	.092	14.5	3.85	167.85	3,350	125x16-ft. open channel.
Wherry Ave. to Lim. Stone 46	.....	.....	.....	2,043.0	23,271.0	8,149	8,051	10,493.1	.66	.69	.72	.81	35,440	.078	13.5	1.98	171.70	1,600	140x16-ft. open channel.
Lim. Stone 46 to Rock Cree	1,061.0	.....	.....	.....	24,332.0	8,149	8,051	10,493.1	.65	.68	.72	.80	35,548	.079	13.6	6.86	173.68	5,600	140x16-ft. open channel.
Rock Creek to Opp. St. 35	.....	.....	.....	2,075.0	24,332.0	8,149	8,051	12,568.1	.62	.65	.68	.77	35,548	.053	11.8	5.79	180.54	4,100	140x18-ft. open channel.
Opp. St. 35 to Gravois Creek	.....	.....	.....	546.0	24,332.0	8,149	8,051	13,114.1	.60	.63	.66	.74	35,548	.053	11.8	3.96	186.33	2,800	140x18-ft. open channel.
Gravois Cr. to Miss. River	10,855.0	.....	3,703	1,987.0	35,187.0	8,149	11,754	15,101.1	.58	.60	.64	.72	43,693	.070	.....	.....	190.29	6,600	150x18-ft. open channel.

Further studies of water consumption and population in 1916 indicated that the sewer would carry the peak flow from a million population, which was not expected for 30 years. It was also estimated that the sewer would give a dilution factor of about 3½ to 1 and that this would reach 1 to 1 in 1940. It is expected that some time thereabouts a supplementary parallel intercepting sewer will be provided.

Upstream from Lindenwood, it was decided to make the upper 3 miles of sewer the equivalent to a 6-ft. circle with about the same capacity (130 sec.-ft.) as the section downstream. Above Dale Ave. the size was further increased, to avoid the necessity for future duplication throughout this section. Capacities here will probably exceed 150 sec.-ft.

The intercepting sewer below Lindenwood is seriously affected by backwater from the Mississippi and cannot give satisfactory service to the low-lying laterals in the southern end of the city when the Mississippi is at high stages. The final solution of this difficulty probably will be the construction of backwater gates on the laterals and pumping plants for the sewage flow.

Capacities for Stormflow

The full computation sheet for expected flows and capacities is shown in Table I. This tabulation is an application of the rational system of design; the time at the upper end (116 minutes) resulted from computation of flow in the existing stream as determined by cross-sections and high water marks, and with some allowance in the lower reaches for straightening and improved channels.

The drainage area within the city is given an average value of 45 per cent impervious. Forest Park is taken as 10 per cent impervious. The watershed in St. Louis County was divided into three belts—an inner district of well-developed suburban character of about 11,000 acres which was given an impervious factor of 30 per cent; a second belt of about 8,000 acres assumed to be developed on a simpler plan with an impervious factor of 15 per cent, and an outer semi-rural area 10 per cent impervious. The rates of runoff used in the computations for each of these classes and for a two-hour time are 76, 70 and 65 per cent respectively.

As a result of these computations, the runoff for which the closed sewers are designed varies from 9,539 to 13,706 sec.-ft., and the open channels will have capacities of from 15,134 to 43,693 sec.-ft. These capacities are very much in excess of any flood which has occurred in the past.

Hydraulic Grades

In establishing the hydraulic grades, it was necessary to consider proper depths of drainage below the improvements immediately adjacent to the stream, and also conditions along the main sewers discharging into it. Nearly all of these sewers are built with their tops below bank level. Consequently they have for years been subject to backwater during flood periods—in the case of extreme floods of as much as 15 ft. As the Des Peres work is intended to give the same drainage standards as have been used for the sewer system, the hydraulic grade is fixed at least as low as the tops of the lateral sewers.

A further and very important variable enters into capacity calculations due to the great fluctuations in the Mississippi River. It was obviously impracticable to attempt to discharge the maximum fifteen-year frequency flood against the maximum possible stage of the Mis-

sissippi, and an investigation was made to determine the probability of an occurrence of an ordinary high flood in the River des Peres during the higher stages in the Mississippi. Out of this general study a discharge design was finally worked out against Mississippi stage of 25. It was found that this stage was practically never exceeded outside of the seven-month period between March and September, and that during these months the probability of a stage in excess of 25 occurring on any one day is one-twelfth. During this same period of the year and from the records of occurrence during twenty years, fourteen rains were found to have occurred which would produce ordinary to excessive high water in the River des Peres. The probability of the occurrence of such a flood worked out as 1/306 and accordingly the occurrence of such a flood against stages in the Mississippi above 25 is to be expected about once in 17 years.

Design of Reinforced-Concrete Arches

At the time of the 1916 report it appeared that the very great cost of the conduits for the River des Peres work would justify further studies. It soon appeared that the critical factor was the character of support or distribution of the vertical loads, and the actual application of the pressure of the earth backfill. Nothing seemed to offer the information desired as to either of these matters. To build and test sections of satisfactory size was out of the question and we were forced to rely entirely on further application of engineering judgment.

The conclusion was reached that the assumption of fixture of arches of this kind at the abutment or invert point was incorrect; that it was not necessary to consider the vertical reactions as distributed across the invert except for soils of extremely low bearing power, and that a certain amount of rotation of the arch axis at the invert was inevitable. Following these ideas stress analyses were made for both completely fixed and completely hinged conditions, and the actual detailing was on the basis of stresses less than the maximum in either case.

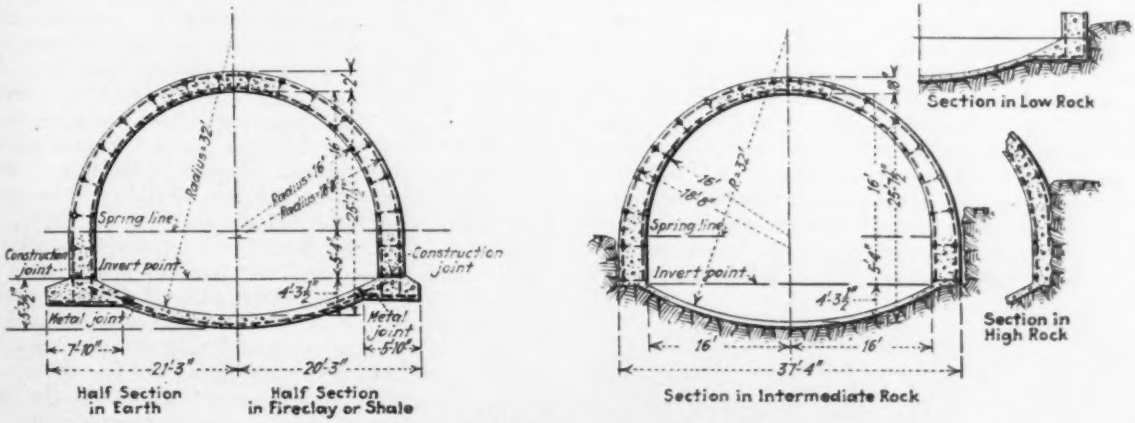
Examinations of the soil along the route, taken with ordinary punch borings and auger drills, indicated that the subsoil changed from a good clay to a hard shale or

FIG. 3—FLOOD OF 1915 ALONG THE RIVER DES PERES IN THE WESTERN PART OF ST. LOUIS

fireclay at about the general level of the proposed footings. The importance of this condition to the design of the footings was so evident that a re-examination was made with a core drill by which actual cores of clay were extracted down to the hard substances and actual cores of the shale and stone were taken with a diamond bit. A study was made of footings to rest on the plastic clays as compared with the footings resting on shale and fireclay, and as a result the structure was lowered to bring all footings onto the hard strata. This permitted the use of narrow footings and consequently a very great saving in the width of excavated trench. A small additional depth of excavation did not nearly offset the other advantages. It was found to be impossible to fit the bottom of the sewer very nicely into the top of the fireclay and shale structure, except for short distances, one of about 600 ft. where a low limestone dike was crossed, and a shorter section where the footings had to be placed on clay.

Sections were designed for earth backfills of 5, 10, 15 and 20 ft. over the crown, and for three different conditions of bearing value under the footings. The sewers were designed for working stresses in the concrete of 800 lb. per square inch and in the steel of 20,000 lb. per square inch.

The specifications for steel reinforcement permitted either billet or rerolled steel. An elastic limit of 50,000



		MATERIALS PER LINEAL FOOT OF 32 Ft. SEWER IN				
		Earth	Fireclay or Shale	Low Rock	Intermediate Rock	High Rock
Concrete (Cu. Yds.)	Above Invert Point	5.510	5.510	5.510	4.819	4.558
	Below Invert Point	2.423	2.044	1.265	0.641	0.641
	Total	7.933	7.554	6.775	5.460	5.199
Reinforcing Steel (Pounds)	Straight	148.0	140.6	75.9	69.1	62.3
	Bent	907.7	884.4	835.0	424.6	399.0
	½" Spreaders	6.9	6.9	6.9	6.3	3.8

FIG. 4—CROSS-SECTION OF THE 32-FT. REINFORCED-CONCRETE SEWER
Note that the invert acts primarily as paving and is not intended to carry any distributed load.

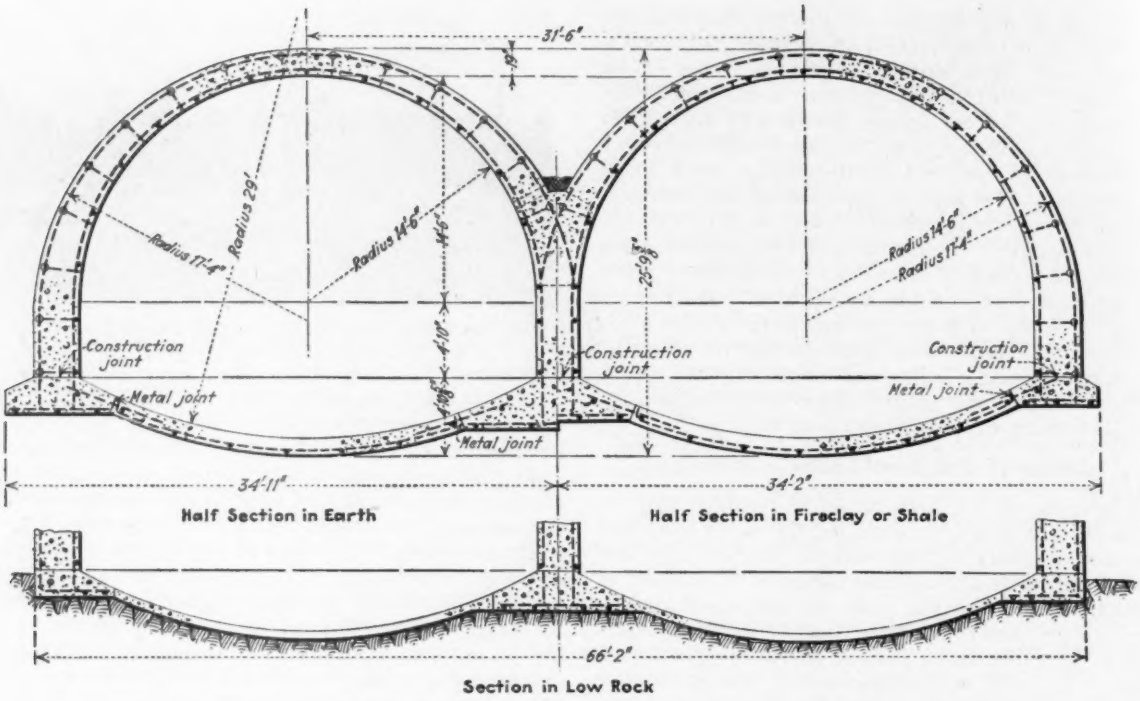


FIG. 5—DOUBLE 29-FT. SEWER FOR THE RIVER DES PERES DRAINAGE WORK
The height of this sewer is slightly less than that of the single 32-ft. section.

lb. and an ultimate strength of 50 per cent in excess of the elastic limit, were required. Undue hardness was controlled by specifications for elongation and cold bend. Concrete required the use of six sacks of cement to each cubic yard, the use of not more than 55 lb. of total water per sack of cement, and the proportion of coarse and fine aggregate to be varied by the engineer, to secure the most workable concrete consistent with good general practice. All materials were required to be measured by weight. A minimum mixing time of 1½ minutes was required. Haulage of wet concrete from a central plant was contemplated and certain general conditions to safeguard this operation were provided.

Steel forms were specified except for certain special structures, and for all arch sewers these forms were required to remain in place until the concrete had attained a compressive strength of at least 1,200 lb. per square inch. To determine this strength, cylinders were cast at the time of pouring and these were stored and cured under conditions as nearly as possible identical with those of the concrete in the forms. This provision necessarily played an important part in all progress schedules. The required time for dropping forms varied sharply with temperature conditions.

Schedule of Construction

As the work had to be constructed in or immediately adjacent to the River des Peres, and as the design requires that the new drainage be very much lower than the old creek, it was obviously indicated that the work should be started at the lower end and should proceed up the valley, thus providing continual low-level drainage for construction.

However, the actual starting at the lower end which would have been the mouth of the River des Peres at the Mississippi River would have placed the earlier construction in the least settled section and not at points of most serious flood damage. Fortunately this could be avoided by taking advantage of the 6 miles of low-level intercepting sewer which had been constructed about 1910 and which made low-level drainage available at Lindenwood.

Accordingly it was decided that the first construction should start at Lindenwood, that the 3 miles of open channel and accompanying construction of the intercepting sewer would be pushed eastward as rapidly as possible and that the construction of the closed sewers would not be started until the low-level flood channels were available to the upper end of this 3 miles.

The 1923 bond issue as a whole was intended to be spent throughout a ten-year period and the bond sales and the resulting tax rates for sinking fund have been scheduled accordingly. The River des Peres project was one of the most urgent of these included in the $87,000,000 budget and it was decided to give it some preference and to attempt to carry it through in about six years. Under this plan the initial contracts would have been let in 1923 and the work should have been completed in 1929. Actually the making of property surveys and the securing of rights of entry postponed the work about a year, and the contract difficulties which occurred on the first section involved about an equal loss of time. With these two exceptions, the work has proceeded as intended, involving during the first three years the expenditure of approximately $2,000,000 for the 3 miles of open channel and intercepting sewer from Lindenwood to section *D*, and since 1927 (when low-level drainage became available) the construction of the large reinforced-concrete sewers at a very rapid rate and the beginning of the construction of the larger open channels between Lindenwood and the Mississippi.

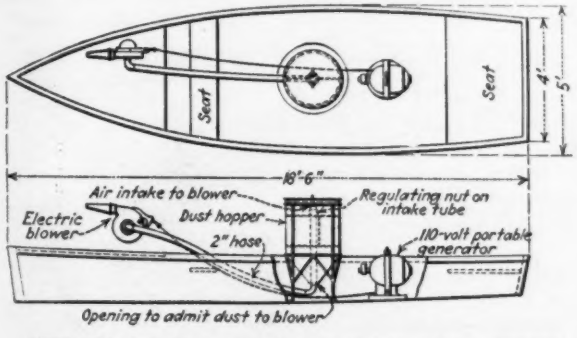
The detailed plans and methods of construction for each of these stages of the work will be described in subsequent articles to be published soon.

Mosquito Control at Saluda Dam

More Than 500 Miles of Shore Line Rid of the Pest at Nominal Cost and Limited Equipment

MOSQUITO control on a shore line of more than 500 miles of the 62,000-acre reservoir created by the Saluda dam in South Carolina is being effectively accomplished at nominal cost with a limited amount of equipment and a crew of six or eight men. This is in face of the fact that climatic conditions in the locality of the reservoir during several months of the year are peculiarly favorable to mosquito propagation and growth.

The recently completed Saluda dam is the largest earth dam in the world, with an over-all crest length of 7,800 ft. The reservoir has a maximum depth of water of 198 ft. when filled to the spillway crest. At that level it has a length of 35 miles and varies in width up to 14 miles. The shore line is unusually irregular at all stages of the reservoir, due to numerous draws and creeks that enter the main river valley. Since the reservoir has been created to store water for power development purposes, the pond level varies constantly.



DETAILS OF BOAT EQUIPPED WITH PARIS GREEN DUSTING OUTFIT

Blower is a 71-lb., ¼-hp. motor, 110 volts; volume delivered, 45 cu.ft. per minute. Generator is a 110-volt, 600-watt generator gasoline-engine drive, weight 110 lb. Dust hopper is made out of 14-gage galvanized sheet iron.

Several types of mosquitoes breed locally, but from a health standpoint it is necessary to control only the malaria carrier. The pest type is, however, more annoying; hence all types must be controlled or the local population would consider the work a failure. Fortunately, the larvæ of all types feed near or at the surface of quiet water close to the shore line and it is possible to kill them by spraying oil on the water a few feet out from that line. Where dense growths of vegetation occur effective oil distribution is difficult at times. Under such conditions paris green is blown over the surface in such manner as to reach the localities inaccessible to the oil-spraying equipment. Since paris green is effective only when the larvæ eat particles of it and since those of the pest type feed below the surface of the water, it is difficult to control these with paris green. For that reason reliance is placed almost entirely on oil treatment.

Extensive local experience has shown that under the most favorable conditions it is necessary to destroy the larvæ once a week. In other words, with a full reservoir and all conditions suitable to the growth of mosquitoes, provision must be made to cover upward of 500 miles of shore line weekly with oil. As a matter of fact, this maximum will rarely if ever be reached for several reasons.

PORTABLE OUTFIT USED IN DUSTING PARIS GREEN

In the first place, there is almost certain to be enough wind to cause sufficient wave action along extended stretches of the shore line to prevent the growth of the larvæ. Heavy rains also check this growth. As fast as the vegetation of the slopes of the reservoir site is killed by submergence there will be less growth in which the larvæ may lodge. In the shallows of the creeks leading into the reservoir and at various other points, however, new growth springs up quickly after the water is drawn down for a time at some seasons of the year. Hence in the future the problem will be mainly to control infestation in such localities, but for some time practically all of the shore line will have to be treated once a week during periods of favorable propagation and growth conditions.

Given these factors, various kinds of equipment were considered. The plan of several fixed camps along the shore line, each patrolling a given section, involved a larger investment, more men and greater operating expense than seemed necessary for the job. Instead, a floating barge was adopted to provide quarters for the entire crew, space for day-to-day supplies and a laboratory. Working out from this floating base of operations are three small power boats from which the spraying is done.

Oil for the treatment is delivered by truck in 50-gal. steel drums to a point at one end of the dam, where it is discharged by gravity through a tank into a 2,100-gal. steel tank built into a simple float framed up on three pairs of steel oil drums as pontoons. The supply and quarters barge is anchored at a protected point along the shore line. The small boats then work out in both directions for several miles, and are usually so handled that

SPRAYING OIL FROM OUTBOARD-MOTOR PATROL BOAT

OUTBOARD-MOTOR PATROL BOATS, OIL-STORAGE FLOAT, CREW QUARTERS BOAT AND TUG OF THE MOSQUITO FLEET

This marine equipment keeps a 500-mile shore line free of mosquitoes.

they can return to the barge at noon for a renewal of their oil supply. Sometimes it is advantageous to keep them out all day and use a fourth power boat to renew their oil supply around the middle of the day.

When the distance at which the spraying is completed becomes too far from the barge for economical operation of the small boats, the barge is towed to another central location by a 25-ft. gasoline tugboat. The latter also handles the 2,100-gal. floating oil tank to and from the supply point at the dam.

The mileage of shore line covered from each set-up of the barge varies considerably. It depends on several factors, including the irregularity of the shore line and the proportion of the latter to be treated. Generally the aim is to keep the travel distance of the small boats down to not more than they can cover in half to three-quarters of an hour, which is about 3 miles.

The small boats are home-made affairs with a flat bottom having a 4-ft. beam and an over-all length of 18 ft. Each is powered with a 3-hp. gasoline outboard motor of the reversible type arranged so it will operate in very shallow water. The propeller can readily be cleaned when fouled and a breaking pin insures against damage when an obstruction is hit. The boats can thus be run close to the shore among almost any growth or floating timbers and also can be maneuvered easily in narrow places and around short turns.

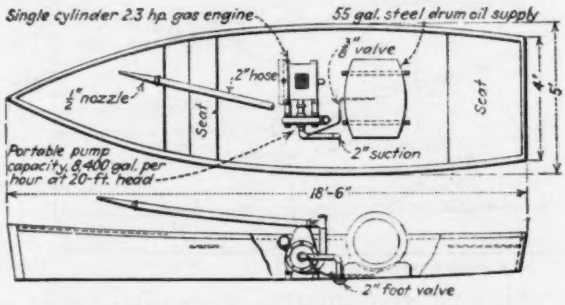
Each boat is equipped amidships with a unit consisting of an air-cooled gasoline engine direct-connected to a centrifugal pump having a 2-in. suction and discharge. The pump draws water through a suction pump let through the bottom of the boat. Oil is fed into the suction by gravity through a ½-in. line connected to a 50-gal steel drum placed aft in the boat.

The pump delivers through a short section of hose fitted with a ½-in. nozzle. A man in the front of the boat handles the hose and also controls with a simple valve the rate at which the oil is fed. The average proportion of oil to water is about 1 to 100; through experience the operator soon learns where to use larger or smaller doses of oil.

A second man operates the outboard motor and controls the boat. The crew of two on each boat are above the class of common labor but do not command skilled labor rates. They soon become quite proficient, and as the pump throws a stream 60 to 80 ft. from the boat they can reach most of the shore line areas while the boat travels along in clear water. In fact, except in coves and along broken shore line stretches, the oil treatment is applied with the boat moving at from 3 to 4 miles per hour. Each crew will thus cover from 30 to 40 miles of shore line a day.

The equipment that has been provided for dusting paris green on stretches that cannot be reached effectively with the hose stream consists simply of a 1½-in. motor-driven portable blower. A portable gasoline-engine-generator unit that ordinarily supplies lighting current on the barge is shifted to one of the boats to drive the blower. The paris green, mixed 5 parts to 100 parts of hydrated lime, is drawn dry by the suction of the blower from a hopper mounted in the boat.

With this outfit paris green can be dusted over a wide area along the shore line with the boat running about the same speeds as in oil spraying. Since the paris green is easily shaken off vegetation by even a slight breeze, complete coverage of the water is assured under dense



ARRANGEMENT OF OIL-SPRAYING EQUIPMENT IN OUTBOARD-MOTOR BOAT

Pumping unit is a trench marine pump, open impeller centrifugal type, with 2-in. suction and discharge, direct-connected to a single-cylinder, four-cycle, vertical, air-cooled 2.3-hp. gasoline engine, all mounted on a structural steel base fitted with handles for easy lifting and carrying. Weight, 160 lb. Capacity of pump, 8,400 gal. per hour at a 20-ft. head.

growths. However, one of the main objections to this method of treatment is that it must be repeated after every rain. Dusting also is impracticable when the wind blows briskly. The apparatus used for spraying oil is effective, except where the vegetation is unusually dense or there are large trees. Since all of the site that will be submerged has been cleared no trees are encountered. It further is expected that dusting will be necessary in the long run only in a few coves and creek valleys, since vegetation along the main shore line will eventually die out from the intermittent submergence.

The oil used is a mixture of commercial grades costing about 13c. per gallon delivered. Kerosene is employed as the destructive agent. A heavy black lubricating oil serves as the base, and a light lubricating oil, known to the trade as No. 1 paraffine, provides the desired distributive qualities. These three grades are mixed in equal proportions by the refiner and delivered ready to use.

The operations and the equipment were developed by Dr. L. T. Coggeshall, formerly of the Rockefeller Foundation, under the direction of N. D. Urquhart, construction engineer in charge of the Saluda dam project for W. S. Barstow & Co., Inc.

Hydraulic-Fill Levee Construction on the Mississippi—II

Study of Dredge Design and Equipment, Behavior of Delta Soils, Water Supply to Inshore Pits, Maneuvering Dredges Between River and Pit and Design of Levees for Economical Hydraulic-Fill Construction Based on Two Years' Levee Work in the Middle Delta Region

By John R. Wilbanks
Wilbanks & Pierce, Dredging Contractors, Rosedale, Miss.

IN HYDRAULIC-FILL levee work on the Mississippi equipment is quite as much a consideration as are methods. Dredge construction and pipe-line practice are in a measure special, and levee topping and finishing offer possibilities in equipment selection which call for careful comparative studies.

Dredge Construction and Equipment

The dredge best adapted for use in building levees on the lower Mississippi should be small enough to be readily moved onto the work and out into the river again by the locking process. It should have an exceptionally sturdy and well-braced hull to withstand being set aground occasionally. It should have power enough to dig clay and buckshot and to maintain a pipe-line velocity of at least 15 ft. per second when digging in these materials. The machinery should be of very sturdy and simple design. The pipe line used is seldom longer than 1,200 ft. and probably averages about 800 ft.

The 12-in. dredge used on the work described has a 24x70x5½-ft. hull of dense Florida pine and draws 4 ft. of water. The sides are 5 in. thick, the ends 6 in. thick and the top and bottom decking 3 in. thick. There are two solid longitudinal bulkheads 5 in. thick. Besides the two bulkheads there are three heavy timber trusses running the length of the hull and eleven heavily trussed crossframes. A hog truss consisting of two 8x8-in. posts and a 1¼-in. steel cable extends along either side of the hull. The construction is such that the dredge can, without injury, be set aground. This is an important item. The deck is solid and the machinery all above deck.

The engine is a 360-hp., two-cycle, cold-start, six-cylinder diesel engine operating at 257 r.p.m. Power for the auxiliary equipment, such as the service pump, the air compressor and the lighting generator, is taken by belt from the back end of the engine and carried to an overhead countershaft, thence by belt to these auxiliary units. A 10-hp. gasoline engine is also belted to the countershaft, and by a system of clutches, the compressor, the generator or the service pump may be operated independently by this auxiliary engine.

Power for driving the dredge pump, the hoist and the cutter is taken from the forward end of the engine through a line of power shafting turning at engine speed; on the shaft in succession are: a flexible coupling, a 48-in. clutch, a sprocket and chain for driving the dredge pump, a 20-in. clutch and at the forward end a speed-reduction unit consisting of two sets of cut-steel gears held in place by a steel base. This unit reduces the speed from 257 r.p.m. to 16 r.p.m.

The chain driving the pump has a 2-in. pitch and is 18 in. wide. It is inclosed in an oil-tight case. The pump is of the heavy-duty type, with a 14-in. suction and a 12-in. discharge. The suction pipe runs on a direct line from the pump to the bow, with only a slight angle at the pump. A rubber suction flexible 6 ft. long connects the suction line on the dredge with the suction pipe on the ladder.

The ladder is 38 ft. long and consists of a frame made of two 18-in. I-beams with suitable cross and diagonal bracing and with a heavy cast-steel ladder head at the forward end. The cutter shaft is 4 15/16 in. in diameter. The cutter is of the basket type and is made of cast steel. Four blades are used in clay and buckshot, and five blades in other material. It is highly important that the blades have the necessary amount of relief or pitch on the back side.

DISCHARGE FROM DREDGE PUMPING BUCKSHOT

From the speed-reduction unit mentioned above as being on the forward end of the power shaft which extends back to the engine, a deck shaft, turning at 16 r.p.m., extends to the forward end of the dredge. The cutter shaft is driven from this deck shaft through a train of three heavy manganese-steel gears. The miter gears and shafting are held in place by two heavy cast-steel yolks, one being bolted to the dredge hull and one to the ladder. Both yolks pivot about the jackshaft which carries the intermediate gear, this shaft being on the line of the ladder hinges. This permits the ladder to work easily at any angle and without any undue strain or friction such as takes place in a universal joint when digging deep. The steel yolks hold the gears exactly in place without any springing or binding. This device has not given one minute of trouble in its four years of operation, and the wear on the gears is very slight.

On the deck shaft leading to the miter gears is a safety cutoff coupling to prevent transmission of an undue amount of power from the engine to the cutter when the latter strikes a log or other heavy obstruction. This coupling consists of two flanges in which the load is carried from one to the other through two ordinary machine bolts ⅝ in. in diameter, set on a bolt circle 20 in. in diameter. These bolts pass through bushings of tool steel, and these bushings shear the bolts in two when

Y-BRANCH LEADING TO RIGHT AND LEFT SETTLING POOLS

something like 80 hp. passes through the shaft. A projection from one flange pilots into the other, thus preventing the bending of the shafts if one bolt has any tendency to shear before the other. This device prevents tearing up the ladder and the cutter or any of the shafting. On the other hand, it allows a plentiful supply of power to pass into the cutter for heavy digging.

Just back of the safety cutoff coupling is a pair of miter gears which take power off the deck shaft onto the jackshaft driving the hoist. From the jackshaft the power goes to the hoist shaft through a single pair of spur gears. All the hoist drums are mounted on a shaft extending across the dredge hull, but this shaft is divided into three sections by two flexible couplings. The drums are the standard ones found on any suction dredge equipped with a cutter; they consist of a drum for hoisting and lowering the ladder, two drums for raising the two spuds and two for operating the swinging lines. The hoist is designed to break a new $\frac{7}{8}$-in. steel cable without bending the shaft. The size actually used on the hoist is $\frac{3}{4}$ in.

The pump is primed by an air ejector, getting its air supply from the storage maintained for starting the engine. This storage has four tanks 20 in. in diameter by 8 ft. long, built to work under 500-lb. pressure. The two-stage air compressor used is built for the same pressure, but under usual conditions only 350 lb. of air is carried. In case the engine is hard to start in extremely cold weather, a greater pressure is used if found necessary.

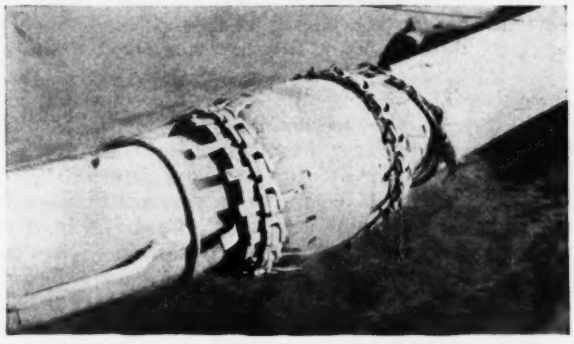
The frame for carrying the spuds is 30 ft. high and is built of timber. The spud wells are of cast steel, built in two sections to permit opening, and are 16 in. inside diameter. They are spaced 11 ft. apart. The narrowest cut the dredge can make when the hull is below the banks is 70 ft.; a width of cut 150 ft. provides the best operating condition. The spuds are gum, pecan or longleaf pine trees and are used just as they come from the woods. They are about 40 ft. long. A cast-iron point is used when the digging is deep or the bottom hard and slippery.

In designing this type of dredge and the incidental equipment used with it, the two points chiefly considered were simplicity of operation (even at the expense of flexibility) and strength of construction. One engine drives the dredge. The cutter turns at a constant speed, and this has been found satisfactory. The hoist drums turn at a constant speed which is the maximum desired, and when a slower speed is wanted, the cone frictions are allowed to slip at the desired rate. The pump turns at a constant speed, except that if the engine is in danger of being overloaded on short pipe lines, the engine is slowed down. The engine loses power almost in direct proportion to the speed reduction, but the load on the pump goes off at a considerably greater rate, thus allowing the engine to be adjusted to a comfortable load. In case an unusual amount of pumping is to be done on a very long or a very short line, a sprocket with a fewer or a greater number of teeth, is put onto the pump shaft. This change in the chain drive is easily made and is not necessary unless pipe lines of unusual length are to be used for considerably long periods of time. For the ordinary run of levee work, two sizes of sprockets will give a sufficient range of speed to allow the engine to develop something like its rated power, and at a speed reduction of usually not more than 5 per cent below rated speed.

As regards strength of construction, all shafting is quite heavy for this size of dredge. All gears are cast or forged steel and all have machined teeth except the miter gears. All castings of any importance are of steel.

Pipe-Line Practice

In levee building it is especially necessary that there be plenty of power on the cutter so that the clay and the buckshot can be readily dug. It is also necessary if a good output is to be obtained, that the suction pipe be larger in diameter than the discharge pipe, giving a low vacuum in the suction line. In order that a high percentage of solids can be carried without plugging the line, a velocity of about 15 ft. per second is desirable. There is a strong probability that the coefficient of friction is lower with these higher velocities because of the fact that the material is carried more in suspension rather than being dragged along the bottom of the pipe line. This condition offers a good opportunity for further development of the suction dredge to secure greater output.



FLEXIBLE BALL JOINT IN DISCHARGE PIPE LINE

The type of pontoon found best adapted to the work consists of two corrugated drums 24 in. in diameter by 20 ft. long, set 9 ft. apart, across which are placed three 6x8-in. timbers, which in turn support saddle blocks carrying a 40-ft. length of pontoon pipe, 12 in. in diameter. The pipe is set parallel to the pontoon drums. The drums are fastened to the timbers by means of hoop bolts. The pipe is $\frac{1}{4}$ in. thick, and is made of high-carbon steel to resist abrasion. This type of pontoon is much more satisfactory than the type which carries the pipe at right angles to the pontoon. Rubber sleeves 24 in. long are used in the line between pontoon sections to permit weaving. These flexible sleeves are fastened to the pipe by means of malleable iron links connected with steel pins. They are easily put on and kept tight.

A 1-yd. dragline of the crawler type with a 45-ft. boom and a 1¼-yd. dragline of the same type with a 50-ft. boom have been used up to the present time to put up dikes, both on the first lift and on subsequent lifts. They have also been used in topping out by dragging up the shoulders and filling in the levee crown with the excess material so obtained. The greatest number of lifts yet used is three, and the greatest height to which the levee has been built above the ground surface is 35 ft.

In order to put up dikes for the second and third lifts when that is necessary, and to use in topping out from the riverside shoulder where the steeper slope makes a long boom unnecessary, a smaller dragline has been secured. This has a ¾-yd. bucket working on a 35-ft. boom. Because of its smaller size and lighter weight it is believed that the dragline will be able to work on softer material than the two larger machines, and may, it is hoped, make unnecessary the operation of draglines on double mats, as is often necessary when putting up secondary dikes soon after pumping in the lower lift.

A very useful combination of dragline equipment for hydraulic levee work would be a light ¾-yd. machine as above described and a 2-yd. dragline of the crawler or walking type, having a 60- or 65-ft. boom but which could carry a 1¼-yd. bucket with the boom extended to 80 ft. There should be one machine on the job that can, when necessary, be quickly moved to points of trouble on the dike line where a break has occurred or is threatened due to the flow of water on the dredge fill.

The length of boom necessary in putting up dikes depends upon the distance it is necessary to reach into the borrowpit to secure the material, and this distance in turn depends upon the grade of the borrowpit and whether or not the contractor will be allowed to dig below borrowpit grade and refill with fine material that flows over the spillways.

There is no pronounced difference in costs as to the various methods which can be used to top off the levee, and each job should be analyzed according to the amount and kind of equipment on hand or available. The usual amount of such yardage to handle is from 500 to 1,500 yd. per station.

Field for Employment

Man power, which is always an important item, is especially important in this operation. Experienced men off salt-water dredges find conditions entirely different, and the operation, as carried out on the river, is a new one.

A typical crew consists of two men on the dredge, a leverman or operator, and an engineer or oiler. Four men are used on the pipe line. The levermen work ten-hour shifts and the engineers twelve hours. The engineers each devote two hours daily to the operation of the levers, while one of the pipe-line men takes care of the oiling during that period of time. Pipe-line men work eight-hour shifts, and the dredge puts in full time, Sundays and holidays included.

There is a good field of endeavor open to technically trained young men, either civil or mechanical engineers, provided they do not object to hard work or long hours. The work is healthful, the pay good and there is never a shortage of help of the untrained variety.

Opportunity for improvement along mechanical lines is great, while the development of better and more economical levees offers a wide field for the exercise of the talents of anyone interested in that character of work.

The Editor Goes Afield—

Regional Problems in Cleveland

Water Supply and Sewerage Requires Skillful Engineering—Special Methods Used in Two New Sewage Tunnels

CLEVELAND, in common with many metropolitan areas, is confronted with the problem of co-ordinating the water-works and sewage-disposal systems of the surrounding boroughs and villages into some sort of scheme satisfactory to all concerned. Pollution of the lake by sewage wastes is getting serious, and city and county engineers are endeavoring to work out some system of treatment. They are handicapped by the fact that a park board which controls almost all of the suitable and available sites has so far been reluctant to permit sewage-treatment plants to be located on any present or possible park sites.

Foundation work has started on the new Lorain-Central viaduct across the Cuyahoga Valley. The Walsh Construction Co. has the contract for the two piers on the river banks, and the Lowensohn Construction Co. for the remaining piers.

A. L. Connelly, Cleveland sewer contractor, has tackled another tough job in West 140th St. This is a 3,500-ft. tunnel through hard shale and rock. Connelly is building a special tunneling machine to handle this job. He also has another one of those sewer tunnels requiring air, located in East 58th St., similar to the job in East 82nd St., described in *Engineering News-Record*, April 5, 1928, p. 550.

About 100 engineers and contractors engaged in building the Cleveland Terminal held an outing recently, the main feature of which was a baseball game between the engineers and the contractors. The score was 11 to 5, with both sides claiming victory. (An *Engineering News-Record* representative was umpire, but he didn't dare say which side won.) This outing ends a series of several held during the duration of the job, which, according to the participants, have done much to promote good feeling and co-operation.

Drill 8,000 Ft. Long Operates 2-In. Bit

Four wells in the Santa Fe Springs oil field in California recently were sunk to a depth of 8,000 ft., the latter part of the drilling being done with a 2-in. fishtail bit. While this depth is not a maximum for oil well drilling, it is claimed by representatives of the Union Oil Company, by whom the holes were put down, to be the greatest depth for such a small drill. The reason for the small diameter was that the wells originally were driven to a much shallower oil deposit and the decision to go to the 8,000-ft. depth, working inside the casing already in, was the result of later discoveries. All four of the holes, it is claimed, show a deviation from vertical from top to bottom of less than 5 deg. and to this high degree of accuracy in keeping the holes plumbed is attributed the success with the small bit.

Channel Span Floated Into Place in Illinois River Bridge

Vertical-Lift 269-Ft. Span Weighing 520 Tons Floated on Five Barges to Complete Highway Bridge at Peoria

By R. E. Havens
Engineer, Vincennes Bridge Co., Vincennes, Ind.

IN THE new highway bridge over the Illinois River between Peoria and Pekin, Ill., a vertical-lift span, 269 ft. c. to c. of end pins, provides the channel opening, the remainder of the bridge consisting of four truss spans of about 180 ft. and two of 100 ft. With the lift span in normal position the headroom is about 9 ft. at high water and 30 ft. 6 in. at low water. The maximum vertical travel of the span is about 56 ft. An old highway bridge with swing span is about 80 ft. downstream from the new structure, while the Peoria Railway Terminal Co.'s bridge is about 240 ft. upstream. The lift span, built on falsework alongside the adjacent fixed-truss span, was floated into position on barges on Jan. 31.

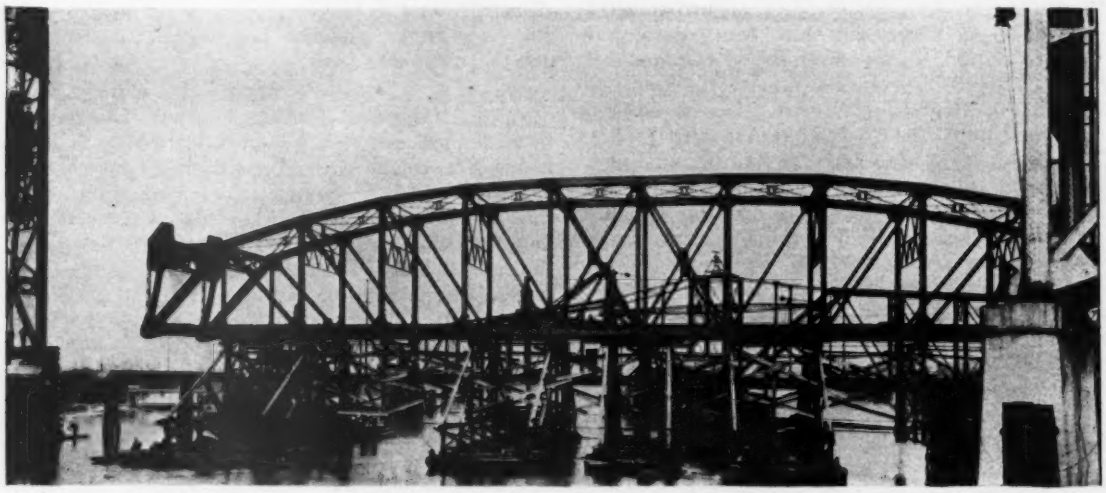
The weight of the completed span is about 522 tons, but it was decided to float the span when assembled sufficiently to be handled with safety—that is, with the trusses, floor system, top and bottom laterals and part of the bracing in place. In this condition its weight was estimated at 354 tons. Adding 150 tons for falsework and 16 tons for a derrick and steam hoisting engine, the total floating weight was about 520 tons. This method was adopted after it was found difficult to hold the required chanel clearance for shipping and at the same time to provide clearance for the old draw span to swing under the new span.

As barges were to be rented and would not be available for some time, it was decided to erect the span on falsework having bays into which the barges could be floated while sunk to within a few inches of the water surface. Then they were adjusted under the cap timbers and blocked up tightly. It was estimated that four barges 20x100 ft. would carry the span with 100 tons of falsework, but as it was desirable to have equipment on the span for erection, it was decided to add the fifth barge at the mid-panel.

In starting, about half of the water was pumped out, beginning at the middle barge and working toward the end barges. As the barges took sufficient weight off the bridge, the caps were cut from the river piles. The upper part of the fourth bent from each end was hung by rods from the floor beam and became part of the bracing to tie the barges together. Lines of 4-in. gas pipe bolted to the long sills were used as spacers for the barges, and they were crossbraced together with ropes and timbers. The outbrace poles, from the caps to the outer end of the barges, were put under compression to distribute the load as much as possible.

Early next morning the remainder of the water was pumped from the barges. This raised the caps and the cut piles 8 in. in the clear. The span was controlled by windlasses on the end and center barges, with block lines running to the railroad bridge piers. A tail line and a head line were used on each windlass, besides several rope slack lines.

With these cables, the span was moved upstream far enough to clear the end piers, leaving the falsework in the river. The east end of the span was moved as near the railroad bridge as possible, so as to get the right angle of movement between the false end-rest piers and the fender piers of the railroad bridge. Then the span was floated into the channel and allowed to drift downstream into position. Submerged piles of the old highway fender pier were struck by the head barge which delayed the work 1½ hours. Movement upstream was started at 9 a.m. and at 3:30 p.m. the span was in place. The span was then jacked up about 3 ft. and seated on blocking on the piers, so as to allow the old highway draw span to swing under it. This elevation is enough for river traffic in the winter. The counterweights, weighing 175 tons, are made to their final outlines, but with large pockets in which concrete was placed to adjust the weight as steel was added to the span.



LIFT SPAN FLOATING INTO POSITION

This bridge was designed by the Illinois State Highway Department, under the direction of Frank T. Sheets, chief engineer, and G. F. Burch, bridge engineer, while the lift span was designed by the Strauss Engineering Corp., Chicago. Both the fabrication and the erection of the steel spans were handled by the Vincennes Bridge Co., Vincennes, Ind., under the supervision of its engineers and Theo. Plack as resident engineer for the state highway commission.

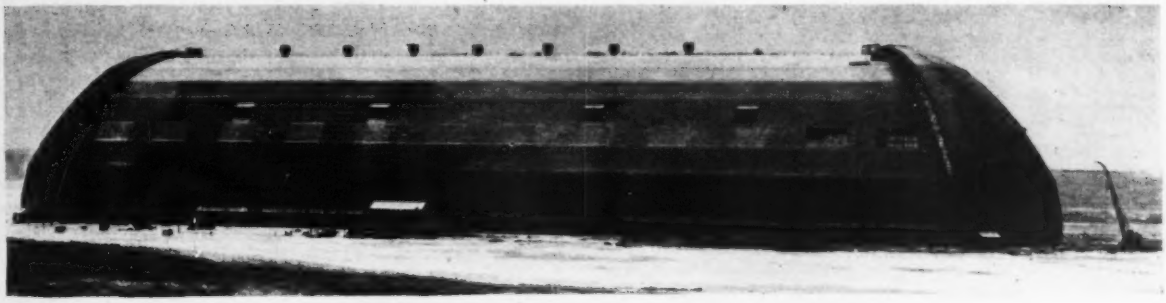


Fig. 1—The Goodyear-Zeppelin Airship Factory and Dock at Akron, Ohio

Design Factors and Structural Details of the Airship Dock at Akron

Parabolic Outline of Building Based on Special Wind Study Which Revealed Importance of Suction Forces—Bracing System of Vertical and Horizontal Trusses—Roofing Design Important Factor

By Wilbur J. Watson
Consulting Engineer, Cleveland, Ohio

This Article, which supplements several others we have published on this novel structure, is based largely on a paper presented before the meeting of the American Society of Civil Engineers in Cleveland two weeks ago by the author, who was retained by the Goodyear-Zeppelin Corp. to design and detail the steelwork. —Editor.

THE DESIGN of the airship factory and dock of the Goodyear-Zeppelin Corp. in which the navy airship "ZRS-4" is being constructed at the Akron, Ohio, municipal airport, resolved itself into the creation of a structure to resist wind and temperature. Dead loads were not great, and live loads, other than wind, were inconsequential, the largest being a 6-ton crane hung from the crown of the arch trusses. In effect, then, the structure to be built was a huge arch roof, without interior supports.

As shown in the accompanying illustrations, the building is approximately a semi-paraboloid in shape; not only is the curve of its cross-section a parabola but longitudinal sections through the end doors form half parabolas. Two doors are used at each end, each door consisting of one-eighth of a sphere, supported at the top by a pin connection to the roof arches and carried at the base on special railway trucks. Dimensions of the building are given in Fig. 4. The structure incloses a floor area of 364,000 sq.ft. and has a total volume of 55,000,000 cu.ft. An article describing the erection of the steel-arch ribs by means of a unique system of counterweighting was published in *Engineering News-Record*, Dec. 5, 1929, p. 874.

Wind Studies—In designing a building to house airships it is essential that the structure itself cause the least practicable interference with the normal wind currents, inasmuch as launching and docking constitute the most difficult part of airship operation. Observations at the United States navy airship dock at Lakehurst, N. J., which is equipped with vertical sliding doors, have demonstrated that the currents around the open doors may obtain a velocity twice that of the prevailing wind. To eliminate such high localized wind currents at the Akron dock, and based somewhat on experience in Germany with two small paraboloid-shaped hangars built in 1910 at Dresden and Liegnitz, experimental studies on a model of this shape were undertaken by Dr. Karl Arnstein, vice-president and chief engineer of the Goodyear-Zeppelin Corp.

Two previous studies of wind pressure on airship hangars have been made in Europe, one in 1914 at the Auteuil Laboratory by G. Eiffel, and the other in 1918 in Germany by Professor Gruening. The results of the Eiffel experiments, made on a 1/100-size model of a hangar of the arch type, are shown in Fig. 2. It was concluded that "there are no positive pressures except on the vertical walls struck by the wind and on the first third of the roof; elsewhere negative pressures prevail, attaining their maximum near the ridge and sometimes before reaching it." Professor Gruening concluded that (1) the pressure of the wind which hits the surface of a building at a right angle is only a fraction of the pressure upon a thin plate; (2) the suction on the roof may exceed the direct pressure by 50 per cent; (3) greatest pressures are produced by short blasts of wind. German practice for computing internal pressures on temporary airship hangars built during the latter part of the war called for 25 lb. per square foot.

Dr. Arnstein's model tests were made in the wind tunnel of the Daniel Guggenheim school of aeronautics, New York University, with a model about 1/240th the size of the Akron dock. A velocity of 50 m.p.h. was used for most of the tests. The shell was perforated with 87 orifices for manometer attachment, 0.09 in. in diameter; 22 similar holes were drilled into two of the door segments. As shown in Fig. 3, the overpressure changed to suction at about 50 to 60 per cent of the height of the building and the suction reached its maximum at a point slightly windward of the apex. Near the doors the change from overpressure to suction occurred at about 72 per cent of the height of the building. Opening of the doors affected only the pressure distribution on the doors themselves. The orange-peel-shaped doors did not cause dangerous localized currents.

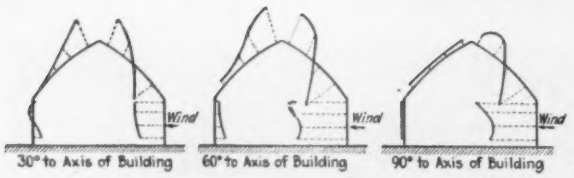


FIG. 2—RELATIVE WIND PRESSURES ON AIRSHIP SHED MODEL FROM TESTS AT AUTEUIL LABORATORY, FRANCE

Diagrams show total pressures at the median section of the shed, with openings placed at the center of the bays of the roof.

Maximum pressures were not positive, but negative. The experiments indicated that the outward force should be assumed at greater than one-half the inward, with provision for securing roofing against local outward forces equal to the full direct pressure. The adopted cross-section of the building was believed to be the most efficient that could be devised to conform with the requirements indicated by the experiments.

Loads and Stresses—For proportioning the members of the building, dead load was assumed as 10 lb. per square foot on roofing sheets, purlins and rafters, 20 lb. on laterals and 30 lb. on the arches. The snow load, in combination with dead load only, was assumed as 30 lb. per square foot on all surfaces inclined less than 45 per cent; in combination with maximum wind load, the snow-load value was reduced to 15 lb. per square foot.

Three classifications of wind loads were considered: (1) ±80 lb. per square foot for all roofing sheets, purlins and rafters in the upper portion of the building, and ±40 lb. for those in the lower; (2) 37½ lb. per square foot combined with internal forces of ±12½ lb. on all bracing and arches, pressures distributed in accordance with the pressure diagram derived from the model experiments. (3) A direct horizontal wind pressure of 15 lb. per square foot on external surface only, with no consideration of interior forces, to be used when stresses due to this load exceed those from wind load in (2) above.

Structural Design—The general design was carried out along lines originally proposed in the Goodyear-Zeppelin Corp. by Paul Helma, assistant to Dr. Arnstein. This design had important aerodynamic advantages and also proved to be economical in the use of steel. Among other things Mr. Helma suggested a system of vertical and horizontal trusses of simple Pratt outline placed between the upper and lower chords of the arches. This truss bracing, known abroad as the Deitz system, proved more efficient than the more common bracing which is placed in the planes of the arch chords, especially since the main supporting arches are rather widely spaced. The vertical trusses take the place of struts which would be necessary in case the usual system of bracing were used, and as they are stronger than such struts, provide greater stiffness. The bracing system also provides maximum unobstructed interior space between the trusses, facilitating the location of catwalks and stairways.

In general, the structure as developed by Wilbur J. Watson & Associates of Cleveland consists of a series of eleven parabolic arches spaced 80 ft. on centers and connected by the system of vertical and horizontal truss bracing. In addition to forming the bracing for the structural shell, these trusses carry light trussed rafters spaced 10 ft. on centers, which in turn carry the Z-bar purlins, 8 ft. on centers. At each end of the main shell are placed two diagonal arches, meeting the end arches at the door pins, which are 800 ft. apart. The doors are built up of similar arched and braced ribs, five half arches being used in each door segment. The horizontal component of the stress of the arches is taken by reinforced-concrete ties placed under the building floor. All material is structural-grade steel except the chords of the main arches, which are silicon steel.

One of the unique features of the design is the entire absence of expansion joints. The three center arches are fixed in position, while all others are carried upon rollers, placed transversely to the axis of the building, allowing it to expand freely as a whole from the center toward each end. This permits the end arches, supporting the upper door hinges, to move laterally about 4 in. under the maximum temperature range, a motion which is taken up partly on the pins themselves and partly by the deformation of the door frames. The forces exerted on the shoes by the expansion and contraction of the steel are transmitted to them by diagonals running to the shoes from a continuous strut placed above the floor.

The diagonal arches at each end of the building were

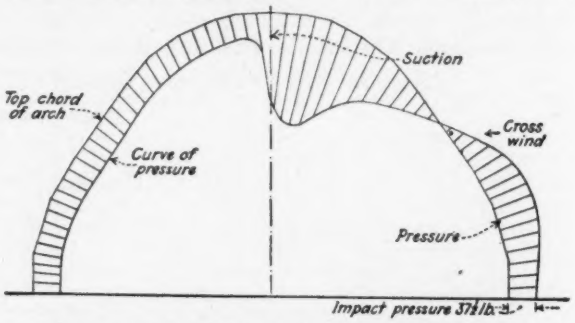


FIG. 3—WIND-PRESSURE CURVE OF MODEL OF GOODYEAR-ZEPPELIN DOCK AT AKRON

treated as three-hinged under all loads, but in order to stiffen the other arches under wind load, it was decided to convert the main three-hinged arches into two-hinged by riveting up the lower chords after the steel was erected. This made necessary the analysis of the statically indeterminate two-hinged arches. Approximate cross-sections of members were obtained from the stresses for a three-hinged arch. All stresses were determined graphically, placing the diagrams on Van Dyke prints having the truss outline, reaction-influence lines and tables for stress tabulation on the original. Owing to the large number of members in the arches, this saved considerable time and labor. In constructing the stress diagrams, templets having the slope of each inclined member laid out to a large scale were used, adding much to the accuracy as well as to the speed of the work. Stresses thus found were combined, and trial cross-sections of members determined, giving due consideration to the probable changes in stresses due to the two-hinged arch action. These trial sections having been determined, a unit horizontal thrust was applied at the reaction hinge and by the use of Williot-Mohr diagrams and Maxwell's law of reciprocal deflections, new influence values for the horizontal reaction were determined. This permitted fixing the correct values for the stresses and the actual sizes of the sections.

Door Design—The spherical doors probably constitute the most unusual feature of the building. Each leaf has approximately the shape of one-eighth of a sphere, 214 ft. wide at the base and 202 ft. high. Each door weighs about 600 tons. The 40 forged-steel double-flanged wheels upon which each leaf rests are 27 in. in diameter and run on a standard-gage track composed of two

100-lb. rails curved to a radius of approximately 188 ft. Each pair of wheels is set radially and each wheel is mounted on a separate short axle, since the wheels on the inner and outer rails must necessarily operate at different speeds. It was not practicable to build the door structure so that the weight would always be equally divided among the 40 wheels. Each wheel, therefore, was separately mounted under bearing boxes which react against heavy springs. If one wheel then gets more weight than its neighbor, its springs will give until the weight is more evenly distributed. The track structure itself is carried on a concrete foundation 10 ft. wide and deep enough to reach below the frost line. It rests on a series of concrete piles driven to rock. An article describing the door-operating machinery was published in *Engineering News-Record*, Dec. 26, 1929, p. 1,008.

The hinge pins at the top of the doors, which are 17 in. in diameter and 6 ft. long, are secured to the roof girders by heavy steel frames. Since a separate pin is provided for each leaf of the door, there are two pins side by side, spaced 4 ft. apart. Each pin is required to resist the side pressure caused by the tendency of the door to fall inward; and in the case of a strong wind blowing through the building with the doors on the opposite end open, it is possible that the pin may at times have to resist a pressure tending to push the doors outward. It is estimated that the pressure against the pin may reach a maximum of about 550,000 lb. inward and 450,000 lb. outward, depending on the snow and wind loads. At no time do the pins carry any vertical weight inasmuch as the doors are horizontal at the top where they bear against the pins.

To provide for any movement of the pins resulting from expansion of the steel frame, the horizontal thrust bearing is made in the form of a ball-and-socket joint, free to move several inches in any horizontal direction and about 4 in. vertically. The bearing ball is about 30 in. in diameter.

Roofing Design—In determining upon the roof to be used, extensive studies and tests were made of various types. It was desired that the roofing should be strong, incombustible and watertight, and furnish the maximum practical amount of insulation. The external covering specified was divided into three types, as shown in the cross-section of Fig. 4. Type A was to consist of metal sheets, pretreated with a protective coating and designed to withstand a load of 100 lb. per square foot either from the outside or inside with limiting deflection of 2 per cent of the span. Type B covering was to consist of similar metal sheets, except that they were to be designed for a load of 200 lb. per square foot either from outside or inside. Type C covering also was similar except that flat-surface waterproofing was to be applied.

The roof sheets that were finally adopted were designed, fabricated and erected by the H. H. Robertson Co., and were made of 22-gage metal for type A surface and 20-gage metal for type B and C surfaces, all deeply corrugated and protected as shown in Fig. 5. In the opinion of the manufacturers, the V type of corrugation gives a steel sheet the structural strength of a series of small beams. Also, a sheet with this type of corrugation was found to compare more closely with ordinary beam deflections than did one with rounded corrugations. The new system of corrugation was developed partly from the company's experience with the covering of industrial buildings and partly from experience in designing roofs and side walls on the United States army hangar at Scotts Field, Ill., and on the large British hangar at Karachi, India, as well as on the roofs of the twin airship sheds at Cardington, England.

The tests made by the manufacturer to determine the necessary gage of metal to meet the load and attachment requirements involved panels two sheets wide by two sheets long, fastened to Z-bar purlins. In order to stimulate both inward and outward pressures, the sheets were successively fastened to the top and bottom of the Z-bars, and uniformly loaded. Both 18-gage open-hearth steel sheets and 20-gage special-grade bessemer steel sheets withstood the 200-lb. load with deflections of less than 2 per cent. The 22-gage sheets proved adequate for the 100-lb. loading. The tests failed to reveal any failure due to shearing of rivets, rivets pulling through the sheets or springing of the fastener straps.

On account of the great cost of insulating the entire roof, it was decided to insulate only the type C surface and 14 ft. at the top of type B surface at present, and to provide for extending this insulation farther down the sides if experiments to be carried out during the first year of plant operation should determine this to be necessary. The insulation used consists of two layers of $\frac{1}{2}$-in. wood-fiber board covered with a tar and gravel roofing for the type C area and with 22-gage steel sheets for the type B area. The purpose of the insulation is to

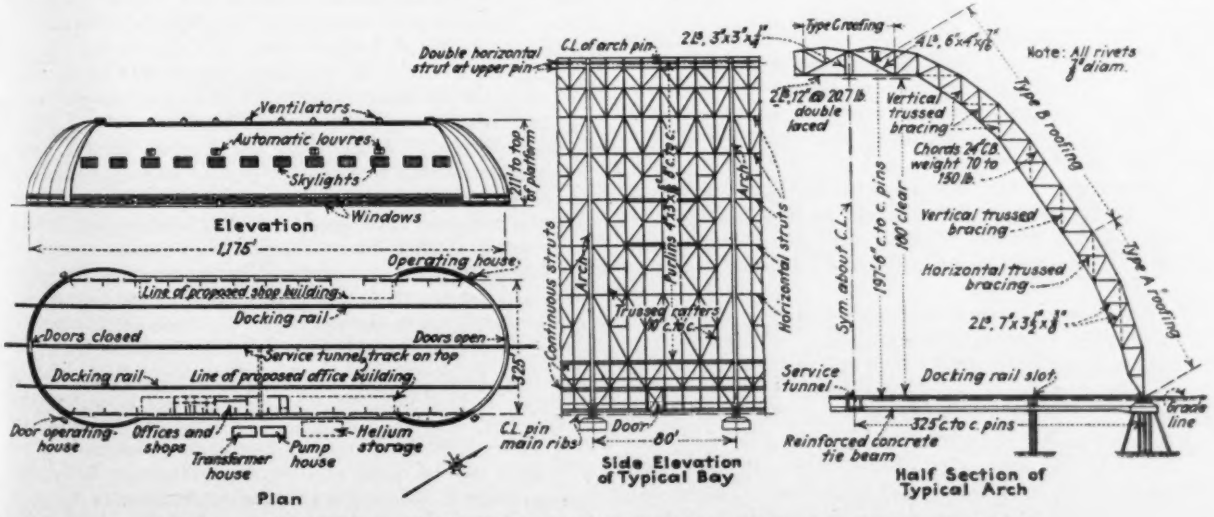


FIG. 4—STRUCTURAL FRAMEWORK OF AIRSHIP FACTORY AND DOCK AT AKRON

reduce the danger of damaging the ship, especially the fabric, as a result of moisture condensation on the inside of the building.

The fastenings consisted of clips riveted to the sheets at each low corrugation. These rivet clips were bent around the Z-bar purlins by a specially designed tool in such a manner as to withstand either external or internal loading. End laps of sheets were bolted with ¼-in. sherardized bolts and side laps with ¼-in. special mushroom head bolts. Fiber and lead washers were used.

Ventilators along the top of the roof and automatic relief vents along the sides of the building were also

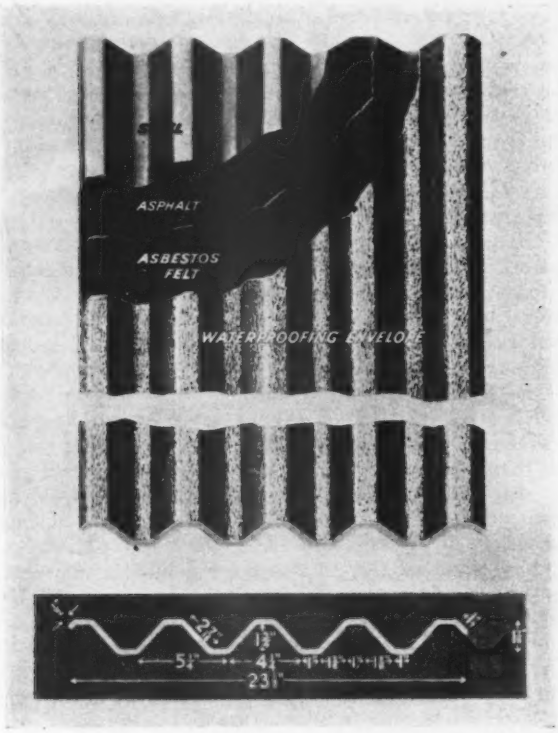


FIG. 5—SPECIAL V-BEAM ROOFING SHEETS
Sheets on lower third of roof of airship dock designed for 200 lb. per square foot load with less than 2 per cent deflection on 8-ft. span.

placed with the roofing. The latter were made of 16-oz. copper and so designed as to open outward automatically when the internal pressure of the structure is 10 lb. per square foot above normal atmospheric pressure, and to close automatically when this pressure is relieved.

Equipment in the Building—As the building is primarily a factory, it is equipped with a considerable number of mechanical handling devices, such as 6-ton overhead electric hoists and vertically adjustable working platforms.

At the center of the structure there is provided a fixed working platform the full length of the building, and at various levels, six on each side, are catwalks 2 ft. wide, running the full length of the building and located between the chords of the arches. Access to the upper platform is provided by two stairways, one on each side of the building near the center, and by a specially designed inclined elevator. This elevator utilizes two counterbalanced cars so built that they remain horizontal at all times. The motors and drums for operating this elevator are located on the upper platform, and the cars can be operated from either car or by a man at the top.

Under the floor at the center of the building is a service tunnel containing electric outlets for lights, power, water, compressed air and gas.

A width of 240 ft. is necessary for assembling the airships. This leaves a space for shops and offices on each side of the building about 42 ft. wide by 640 ft. long. Eventually it is expected that the shops and offices will occupy all of this space, but at present they will be confined to one end of the building. Because of the expansion and contraction of the main building frame, it was necessary to build these offices and shops entirely independent of the main building and it was also necessary to use fireproof construction for them. The offices and shops are heated, but the main building is not.

Only a very small amount of natural light is provided inasmuch as most of the manufacturing operations will require artificial light. All electric current is brought to the building underground. Transformers are located outside of the building and distribution is accomplished through six weathertight main distributing panels also outside the building so that any arcs accompanying switching will not cause a gas explosion.

The personnel in charge of the Goodyear-Zeppelin airship factory and dock consisted of P. W. Litchfield, president; Dr. Karl Arnstein, vice-president and chief engineer; W. C. State, consulting engineer; and Wilbur J. Watson.

Water Surveys Aid Power Development in Wilderness of Northern Canada

An outstanding example of the value of the hydrometric surveys, conducted in Canada by the dominion water-power and reclamation service, is contained in the recent announcement of the intention of the Hudson Bay Power Co. to develop 275,000 hp. at the Abitibi River canyon, in northern Ontario.

Anticipating that power development in the Abitibi canyon would become a live issue in the early future, the service, early last year, made arrangements to secure additional hydrometric data. For ten years past a gaging station had been maintained at Iroquois Falls, on the Abitibi River, and although the records from this station furnished reliable data as to the water supply, additional records at the canyon, which is about 115 miles downstream toward Hudson Bay, were desirable. These additional records would establish a relationship between the flow at Iroquois Falls and that in the canyon and render available at the latter site approximate data, not only of the water available for power development but also of the extreme low and floodflows.

Accordingly in April, 1929, an engineer of the service was sent north to establish gaging stations at Island Falls, 90 miles downstream from Iroquois Falls, where there is a power development, and at the canyon, which is 25 miles farther downstream. This engineer worked continuously until well into July measuring the flow alternately at the two stations and returned in September to take further measurements. As a result of this operations a complete relationship between gage height and flow was established at each station for flows ranging from 5,000 to 40,000 sec.-ft. The ratings thus secured at the canyon and at Island Falls were supplied to the engineers of the Hudson Bay Power Co. and, correlated with long-term records at Iroquois Falls, provided them with sufficient information to deduce long-term records for the lower river and to complete studies and prepare designs for the new power enterprise.

Water-Station Reservoirs on the Illinois Central Railroad

Poor Well Supplies Lead to Use of Impounding Reservoirs—Earth Dams With Concrete Spillways—Horseshoe Spillway

By C. R. KNOWLES
Superintendent of Water Service, Illinois Central Railroad

ON the new 169-mile Edgewood cutoff of the Illinois Central Railroad, between Edgewood, Ill., and Fulton, Ky., there are eight water stations (seven in Illinois and one in Kentucky), of which five are supplied from impounding reservoirs, two from deep wells and one from a stream. Of the four dams and reservoirs constructed by the railroad, the principal features are given in Table I. At Groat, Ill., the water supply is obtained from a reservoir of 1,000,000,000-gal. capacity owned by the United States Fuel Co., the railroad laying an 8-in. pipe line to the pump house at the water station, a distance of about 2 miles. All of the eight water stations have oil engines belted to centrifugal pumps which deliver the water to 100,000-gal. tanks, 20x30 ft., of creosoted wood and mounted on timber towers 20 ft. high. The tanks are connected to 12-in. water columns adjacent to the track.

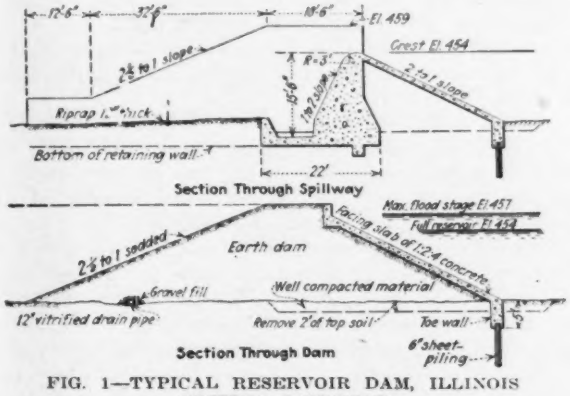


FIG. 1—TYPICAL RESERVOIR DAM, ILLINOIS CENTRAL RAILROAD

Reservoir Supply—Our reason for the construction of reservoirs furnishing surface-water supply was the fact that the greater part of the territory through which the line passes in Illinois is underlain by coal measures, comprising deposits of shale alternating with limestone and standstone and coal seams. Probably 80 per cent of the entire formation is composed of impervious shale material yielding limited quantities of water. The limestones are mostly compact and impervious. Such underground water as may be obtained comes from the sandstones, but these are associated with carbonaceous materials containing various mineral salts that make the water objectionable for boiler purposes, and it was impossible to secure subsurface water, either adequate in quantity or of satisfactory quality, north of Reevesville. As an example of the unsatisfactory character of the groundwaters, the wells at the Bluford shops yield water having the analysis shown in Table II. For comparison, a typical analysis of reservoir water is given in the same table.

In the absence of suitable groundwater or adequate natural surface supplies, the only method available was the construction of impounding reservoirs. Fortunately, much of the country offered suitable locations for reservoirs formed by simply building dams in the valleys of small streams. Therefore the problem of providing water between Edgewood and Ferber, 127 miles, became one of selecting sites for reservoirs with drainage areas providing sufficient runoff to keep them supplied with water. The minimum average annual rainfall in this section of the country is about 25 in.

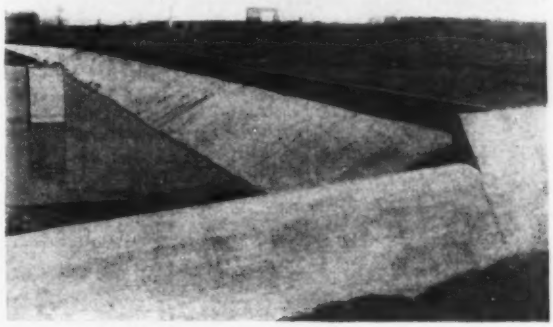


FIG. 2—DAM AND SPILLWAY AT BLUFORD, ILL. Concrete spillway in foreground, but earth not removed from channel. Concrete face of earth dam at right.

Dams and Spillways—All the dams are of earthfill construction, having a puddle or sheetpile core carried down into solid ground and having a reinforced-concrete slab facing on the water side. Typical dam construction is shown in Fig. 1, for the Ferber reservoir, this dam being 18 ft. high above groundlevel or 13 ft. at the spillway. Here the toe to form a cutoff wall caps a line of triple-lap wood sheeting. The slopes are 1 on 2½ for the downstream side, which is sodded, and 1 on 2 for the upstream side. This slope has a facing

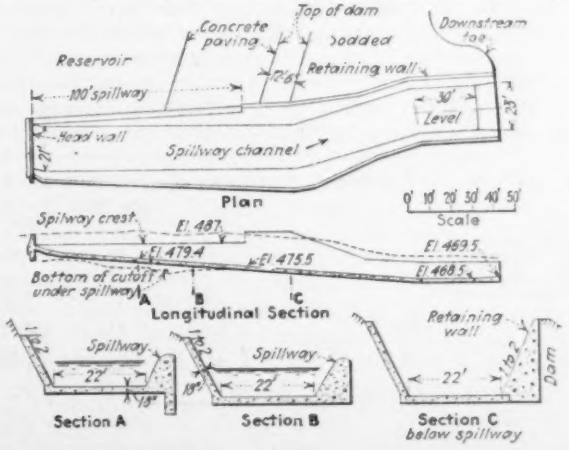


FIG. 3—DISCHARGE CHANNEL AT BLUFORD DAM

TABLE I—WATER-STATION RESERVOIRS, ILLINOIS CENTRAL RAILWAY

	Mango	Greendale	Bluford	Ferber
Water area, acres	33.8	71.6	100	52.3
Drainage area, acres	840	4,740	2,029	1,360
Storage capacity, mill. gal	109	82	209	107
Height of dam, ft.	30	10	22	19
Length, earth dam, ft.	523	255	698	654
Length, concrete spillway, ft.	88	350	100	91
Earth in dam, cu.yd.	38,300	6,324	22,908	22,311
Concrete in spillway, cu.yd.	3,042	2,623	1,485	1,248
Concrete facing slab, sq.yd.	2,881	400	2,008	2,435
Annual runoff, mill. gal.	126	650	275	175
Annual consumption, mill. gal.	.....	.....	....	....

of 1 : 2 : 4 concrete applied in two 4-in. layers, the top or outer layer being reinforced with ½-in. bars spaced 16 in. both ways, the bars extending up into the 18-in. parapet wall. To intercept seepage, a drain of 12-in. vitrified clay pipe is laid near the downstream toe and covered with coarse gravel. At this reservoir the spillway, of 1:2½:5 concrete, with a length of 90 ft., is at the middle of the dam, and the drains discharge through the retaining walls forming the spillway channel.

A reinforced-concrete spillway is provided at each reservoir, and at Bluford this spillway is at right angles to the earth dam, with a concrete channel leading the waste water to the old course of the stream. This

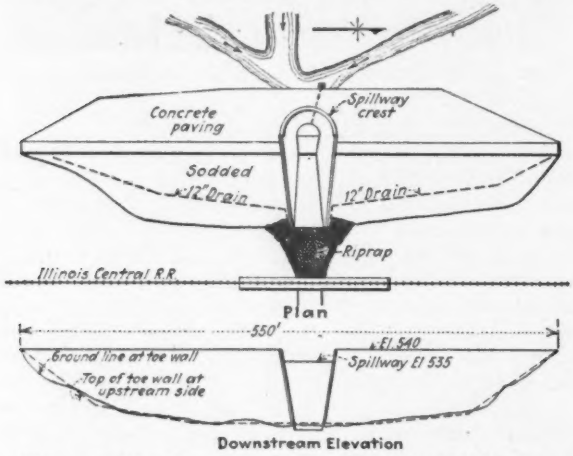


FIG. 4—DAM WITH CURVED SPILLWAY, MANGO, ILL.

reservoir is shown in Fig. 2, with the spillway in the foreground, but the earth had not then been cleared away from the spillway channel, which extends to the right and ends at the old stream channel. The design of the concrete spillway channel is shown in Fig. 3.

At the Mango reservoir (Fig. 4) the concrete spillway is at the middle of the earth dam and its channel ends at a riprap apron which extends beyond the downstream toe of the dam. This arrangement is similar to that at the Ferber reservoir (Fig. 1), but owing to insufficient room for a straight spillway of the necessary length and capacity, a curved or segmental spillway was

TABLE II—COMPARISON OF WELL AND RESERVOIR WATERS

	Grains Per U. S. Gallon	
	Well	Reservoir
Solids	....	0.23
Iron, alumina and silica oxides	0.04	2.91
Calcium carbonate	25.10	....
Magnesium carbonate	3.43	0.88
Magnesium sulphate	19.10	0.68
Total incrusting solids	47.67	4.70
Alkali chloride	2.05	0.89
Alkali sulphate	5.60	1.17
Total non-incrusting solids	7.65	2.06
Total solids	55.32	6.76

FIG. 5—CURVED SPILLWAY IN MANGO DAM

built, forming a pit or tumbling basin from which the discharge channel leads to the toe of the dam. This spillway (Figs. 5 and 6) has a radius of 28 ft. on the crest and a depth of 33 ft. to the bottom of the pit or 27 ft. to the floor of the discharge channel. An 18-in. drainpipe is led through the dam and spillway wall, with a valve located in a chamber which is accessible through a shaft and tunnel, as shown in Fig. 6.

No regulating gates are placed on the spillways. At each reservoir the outlet is a 12-in. pipe line laid through the earth dam to a concrete shaft built inside the reservoir. This pipe has a swing joint, so that it may be raised or lowered to correspond with the water level in the reservoir.

Stream and Well Supplies—At Saline, Ill., the water station is supplied from Saline Creek. Although the flow of water is very low in the late summer, there is an abundant supply for ten to eleven months of the year, and as the topography does not lend itself to the construction of an impounding reservoir of sufficient capacity, it was considered advisable to depend upon the stream and impound enough water within its banks by a low temporary dam to carry over the extreme periods of drought which occur every two or three years.

At Reevesville, Ill., and Lowes, Ky., the water stations are supplied from wells. The two wells at Reevesville are 10 in. in diameter and 92 ft. in depth, cased with 10-in. wrought-iron pipe. The strainers are 10-in. tubular brass with 0.06-in. openings and are 20 ft. long. Water rises to within 8 ft. of the surface and each well tested 390 g.p.m. with a draw down of 6 ft. The two

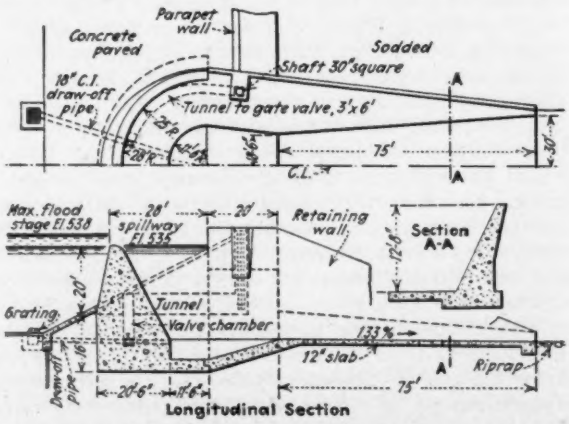


FIG. 6—DESIGN OF CURVED SPILLWAY

wells are pumped with two centrifugal pumps at a rate of 500 g.p.m. for both wells. Owing to the possibility that the water level may be lowered, the pump pits were depressed about 4 ft. below the surface of the ground, leaving the static head of the wells about 4 ft. below the pumps. The Lowes water station is also supplied by two 10-in. wells, but these are 190 ft. deep. The water rises to within 40 ft. of the surface and the head is lowered about 20 ft. when they are pumped at the rate of 200 g.p.m. They are cased with 10-in. wrought-iron pipe and have 10-in. tubular brass strainers 30 ft. in length with 0.03-in. openings.

The design and construction of these dams and water stations was done under the direction of the writer.

Contamination of Water Systems by Consumers' Water Uses

Operators Cite Dangerous Abuses of Water Services—Need for Constant Study of Installations Is Stressed

THE danger that consumers will contaminate water in the pipes of the distribution system should be given careful consideration by those responsible for the water-purity standards in any large system, said speakers at the Del Monte meeting of the California Section, A.W.W.A., last fall, who cited numerous instances of actual contamination by consumers. A paper by S. B. Morris, chief engineer, Pasadena water department, pointed out that it is necessary to put certain restrictions upon the use of water by consumers after the water has passed through the meter to private premises.

The more common dangers are of the sort resultant from submerging the delivery pipe in containers of various sorts, such as laundry trays, hospital sterilizing equipment, etc., from which contaminated water may flow back into the water system if the water pressure fails temporarily or is overcome by a higher pressure originating on the consumer's premises. Many plumbing fixtures now on the market are of a design such as would permit contamination under certain conditions, Mr. Morris said. Occasional unexplained B. coli counts in the water-distributing system at times when no such contamination is revealed at the distribution reservoirs indicate that such accidental contamination actually is occurring from improper use or improper fixtures on consumers' premises.

Co-operation with the building and plumbing inspection departments of the city is of primary importance, but is not entirely sufficient, Mr. Morris pointed out, because temporary connections that could cause contamination may be made at any time on an installation that otherwise meets all requirements. A collection of citations illustrating the dangers was presented in Mr. Morris' paper and was supplemented by discussion from the floor. Typical cases are abstracted in the following.

1. A consumer's complaint of excessive lime in the water was traced to a water-softening plant, where it was found that water heavily dosed with lime had been forced back into the distribution system. This came about when a check valve failed to operate during an emergency shutdown of the water supply; the lime water stored in an elevated tank simply flowed into the distribution system.

2. Complaint from a school cafeteria that excess chlorine in the water was discoloring the silverware led to a prompt investigation. The cafeteria, it was found, was receiving its water through a connection with the circulation line from the school's swimming pool. Apparently a serious epidemic had been averted by the fortunate circumstance that continuous excess chlorination of the swimming pool water had been employed.

3. Complaint of sewage odor in the showers at a public swimming pool resulted in the discovery that raw sewage was being pumped into the water supply. In this case there was a sewage-pumping plant about 500 ft. from the swimming pool and centrifugal pumps there intermittently raised sewage from a storage basin to trunk sewers at a higher elevation. Because the sewage pumps were located above the storage basin and operated on a suction head, they had to be primed each time they were started. The pump operator frequently had difficulty in priming the pumps, so he made a more or less permanent connection by means of a hose from a valve on the city water supply to a stopcock on top of the pump. At the time of the complaint the pump operator had forgotten to close the stopcock after the pump started and the pressure on the sewage pump line, being in excess of the domestic supply, forced the sewage through the meter into the domestic system.

4. Complaints about air in the water supply in a certain part of town came in at about the same time that a meter was found to be registering backward. Investigation showed that the machine shop and garage supplied by this meter operated an air compressor and an air storage tank. To diminish the water bills the proprietor of this shop had been reversing the meter by pumping air into the system. Probably no contamination resulted from this operation.

5. A device recently put on the market in California includes a cabinet, recessed into the bathroom wall, in which chemicals used as disinfectants are added to the water supply under pressure. Temporary failure of the water pressure might result in the forcing into the system of the highly poisonous contents of such cabinets.

6. Heavy fuel oil at one time appeared in consumers' services in a portion of Oakland, Calif., in such quantities as to make the fluid look more like oil than water. Investigation disclosed the fact that a paving company was using fuel oil in the operation of its steam plant near the area where this trouble was reported. The paving company used an oil storage tank at this plant, served by a pump which delivered the oil from tank cars to the storage tank. A carload of oil had been delivered on the siding at this plant and the suction of the pump was connected to the tank car for unloading. The plant operator, in attempting to connect the discharge of the pump to the line leading to the oil storage tank, made the error of connecting to a valve on the water-distribution system. Opening this valve, he started the pump and pumped the entire carload of oil through the meter and into the water system. The error of the pump operator was not discovered until brought out in the investigation that resulted from complaints of consumers. Naturally great difficulty was involved in freeing the distribution system of oil. The affected area was isolated, all hydrants were opened, and consumers were instructed to leave their fixtures open until the oil was flushed out. Water bills for the current month were cancelled and wherever damage occurred to house equipment, to utensils or to clothing being washed, full restitution was made, the lost revenue and damages amounting to a very considerable sum.

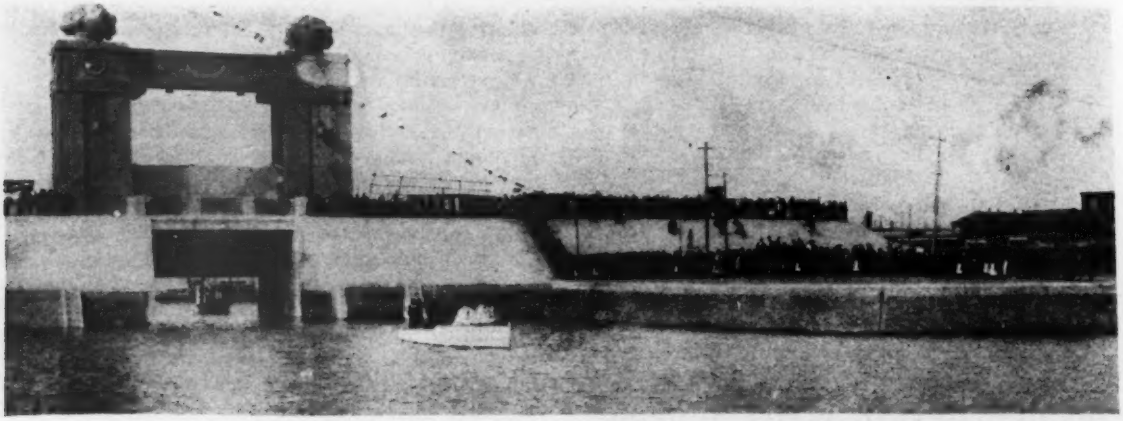


FIG. 1—HARBOR IMPROVEMENTS AT KAWASAKI, BETWEEN TOKYO AND YOKOHAMA
Vertical sea wall and gate towers built of reinforced brickwork.

Reinforced Brickwork Used in Much Japanese Construction

Steel Rods Embedded in Masonry Take Tensile Stress—Notched Bricks Laid in Usual Manner —Tests Confirm Design Theory

REINFORCED brickwork, consisting of the usual form of brick masonry laid in combination with steel rods to increase tensile strength, is beginning to come into common use in Japan as a result of the success obtained with this type of construction in buildings, walls, culverts and other types of engineering construction. A few examples of such structures are illustrated on these pages. The use of reinforcement in brick masonry, at first confined almost exclusively to government undertakings, is now spreading to private work. This form of construction is also used to a considerable extent in India, as described in *Engineering News-Record*, Feb. 21, 1929, p. 304.

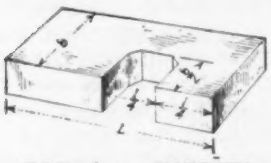


FIG. 2 — NOTCHED BRICK FOR USE WITH STEEL REINFORCING

Development of this form of construction in Japan was facilitated by the invention, about ten years ago, of a special form of notched brick which can be laid in combination with common brick in all the types of bond commonly used and which provides continuous vertical openings to accommodate steel rods. Patents on this brick were issued about seven years ago both in Japan and in the United States to Dr. Shigeyuki Kanamori, of the department of home affairs of the imperial Japanese government. This department is similar to the department of the interior in the United States, but is also charged with the construction of government works, such as harbors, roads and river improvements. The department of home affairs and the Japanese navy have been the principal users of reinforced brickwork up to now.

The form of brick developed by Dr. Kanamori as the best from the theoretical point of view is shown in Fig. 2. Practically, it has been found that losses in manufacture with this section are heavy, because of a tendency to crack during drying or burning. Better results are obtained by substituting a cylindrical hole for the notch, leaving a small bridge of clay across the opening which is broken out by the bricklayer. Aside from this notch or opening, which extends halfway through the width of the brick and is placed in one of the interior quarters, measured lengthwise, the shape and dimensions of the special form are the same as for common brick. It is manufactured by the usual wire-cut process. In laying by the ordinary method, such as English or Flemish bond, the special brick is used in combination with ordinary brick in such manner that the vertical holes through the wall or other construction are continuous.

Japanese experience indicates that reinforced-brick walls can be laid as easily as the ordinary type. The vertical steel rods are placed first and are securely fastened in position, often being anchored in a concrete footing. Rigid fastening of the rods is necessary, because any vibration or movement tends to break the bond between steel and freshly placed mortar, which is placed in the space between the rods and the bricks as each course is laid. A 1 : 13 mix of portland cement mortar is preferred. In addition, horizontal steel may

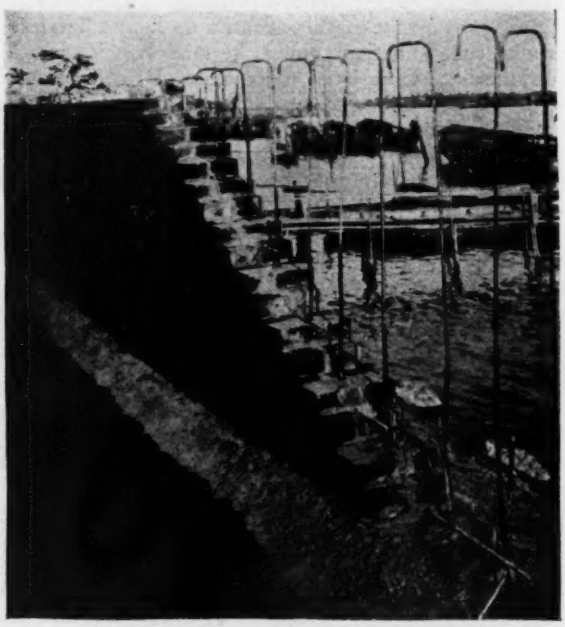
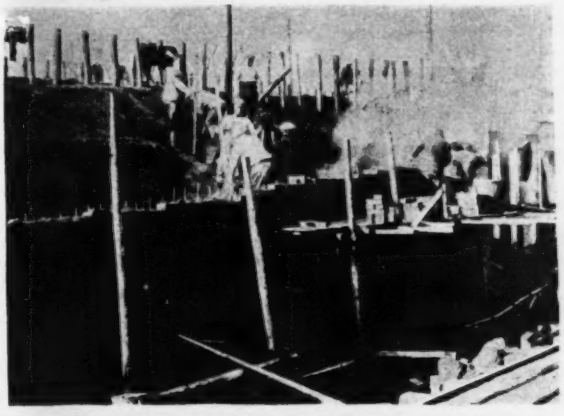


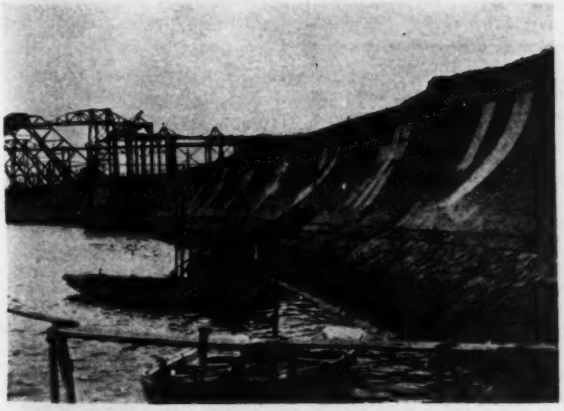
FIG. 3—LEVEE PARAPET UNDER CONSTRUCTION

be supplied by any form of horizontal wiring or separator connection that can be inclosed in the bed joints of the brickwork or, if necessary, by larger horizontal rods placed in a course of split brick. Accurate spacing of the vertical rods is essential and for this purpose it is customary to lay one course of brick before bedding the steel in concrete footing.

The theory of reinforced brickwork design is identical with that of reinforced concrete. In both cases the masonry takes the compressive stress, while the tensile stress is transmitted to the steel. Recommended values for design, which have been thoroughly checked by tests, are: steel, 16,000 lb. per square inch; brick, 500 lb. per square inch. The ratio of moduli of elasticity is taken as 25, except with hard burned brick, for which this ratio is reduced to 20, with an increased allowance for compressive strength. Two kinds of bond stress must be considered: that between steel and mortar and that between mortar and brick. Data on the former are readily obtainable from concrete practice; proper economy demands that the second type of bond stress, that between brick and mortar, should be made of equal capacity for full utilization of the steel strength. This is one factor which determines the necessary size of the notch in the brick. An additional requirement arises from the necessity of protecting the steel from corrosion and from damage by fire. As bricks absorb water and transmit a certain amount of heat, protection must be provided by the mortar itself. As a result of a series of tests, Dr. Kanamori has determined that the 2x2-in. notch used in his special brick can be used with steel rods of a maximum diameter of 1 in. Smaller rods may, of course, be used to carry loads of small magnitude.

Reinforced brickwork, it is claimed, combines the advantages of reinforced-concrete construction with the durability, fireproof quality, good appearance and simple and fast construction found in ordinary brickwork. Construction time and expense are saved by the elimination of formwork and of the curing period.





FIGS. 4, 5, 6—THREE EXAMPLES OF REINFORCED BRICKWORK IN JAPAN

Top: thin retaining wall along railway. Center: small box culvert. Bottom: river revetment 30 ft. high; vertical reinforcement ¾-in. rods 9 in. on centers.

Federal Power Control Clarified by Attorney-General

Control Over Upper Parts of Navigable Streams Affirmed—Scenic or Recreational Needs Cannot Affect License

LEGAL opinions on six disputed points of federal power regulation, relating particularly to the proposed Cumberland Falls project in Kentucky, have been submitted to President Hoover by Attorney-General William D. Mitchell. Some of these questions are general in form, but as they arise from the application of the Cumberland Hydro-Electric Power Co., the opinions, in accordance with established precedent, will be applied only to this particular case. The questions submitted to Mr. Mitchell, and the opinions expressed by him, are as follows:

1. Does the jurisdiction of the Federal Power Commission extend to entertaining, on their merits, applications for the licensing of dams and like works in any non-navigable stream whose waters flow into a navigable stream?

Construction of a dam on the upper non-navigable part of a stream which, in its lower reaches, is a highway of interstate commerce subjects the owner of the dam to the risk of being assailed on the ground that his dam has an injurious effect on commerce. His investment is subject to this hazard. The provisions of the law are intended, among other things, to enable those proposing to construct such a dam to obtain a ruling from an agency of the federal government in advance of construction as to whether the proposed structure would injure the navigable capacity of lower navigable portions of the stream. The statute does not require those proposing to erect such a dam to file application for license with the Federal Power Commission; if they choose to proceed without a license and take the risk of later proceedings by the federal government to enjoin the maintenance of their dam, they are at liberty to do so . . . On the facts submitted, I am of the opinion that the commission has jurisdiction to entertain the application of the Cumberland Hydro-Electric Power Co. for a license to carry out its project on the Cumberland River.

2. May the navigable capacity of a given stream be determined as a question of law by your department [of Justice] upon a statement of the evidence, or is it a question

of fact to be determined by the [Federal Power] Commission in the first instance and later by the court.

Whether a stream is navigable is a mixed question of law and fact. The first step is to determine what is the definition or test of navigability. The next step is to apply that test to the facts of the case. . . . The definition or test of navigability . . . is a matter long since settled by the courts. In United States vs. Holt State Bank, 270 U. S. 49, 56, it was said that . . . "Streams or lakes which are navigable in fact must be regarded as navigable in law; that they are navigable in fact when they are used, or are susceptible of being used, in their natural and ordinary condition, as highways for commerce." . . . The ultimate fact of navigability is one which, in dealing with applications for license, the Federal Power Commission is required . . . to determine . . . It would not be in accordance with precedents to submit to the attorney-general a statement of the evidence and ask for his opinion as to the navigability of a given stream.

3. On the hypothesis that the Federal Power Commission has jurisdiction to entertain and pass upon an application for a license for a dam or other structure in a non-navigable stream, is it the duty of the commission to grant such license in a case wherein it finds that the interests of interstate or foreign commerce would be promoted by the proposed construction on account of the improved resulting navigable capacity of the lower and navigable reaches of the same stream; and this, despite the fact that the commission, if it were to consider such esthetic, recreational, economic and other features of the situation as well within the scope of the functions of the state governments and not of the national government, would conclude that the public interest, regarded as a whole, would be best served by denying the application for a license?

4. In respect of the pending Cumberland Falls project, may the commission properly be influenced in its decision by the fact, if it finds it to be a fact, that there is public need for a recreational and scenic park at Cumberland Falls; that the pending project would be detrimental to such a park; and that, on the whole, the consideration just suggested is entitled to outweigh the advantage of a slightly improved navigable capacity of the lower Cumberland River resulting from the effectuating of the project?

There is nothing in . . . the law that authorizes the commission to deny or grant a license in a case like that under consideration because of esthetic, recreational, scenic or like considerations. . . . The power of the federal government rests wholly on the commerce clause [in the Constitution] and the consequent power to control and improve navigation on streams suitable for interstate and foreign commerce. . . . The United States has no power to prevent the erection of a dam at Cumberland Falls unless the effect of the dam would be to impair substantially the navigable capacity of the lower reaches of the river.

State Action Irrelevant

5. In cases in which the construction of a dam or other work across or in a non-navigable stream is contemplated and a license is sought therefore . . . has the Federal Power Commission authority and jurisdiction to grant such a license as may justly protect or tend to protect the licensee against interference by authorities of the state government, in respect of the work mentioned in the license, or may the commission only grant a license evidencing the fact that the federal government interposes no objection to the construction and operation of the proposed work?

6. Whether any jurisdiction that the commission may have possessed relative to the proposed project has been superseded or terminated by two statutes enacted by the legislature of Kentucky on March 10, 1930, looking toward the acquisition by the state of an area including Cumberland Falls for state park purposes?

Granting of a license by the commission to the Cumberland Hydro-Electric Power Co. . . . would not operate to interfere in any way with the state's power to acquire the property . . . for recreational or park purposes. . . . A license could not . . . be made to operate in any way to prevent the acquisition by the State of Kentucky, for park or other purposes, of the site of the proposed dam and adjacent lands, either before or after the erection of the dam. . . . On the other hand, it is clear that the statutes . . . recently passed by the legislature of Kentucky . . . do not supersede or terminate the authority or duty of the commission with respect to the application for a license. . . . The mere fact that such an acquisition is a possibility or probability is not sufficient to justify the commission in refusing to perform the duties imposed by this statute [the federal power act].

The Engineer's Professional Status

By W. E. Wickenden

THE EARLY decades of American engineering had a pioneer civilization as their setting. The scattered group of land surveyors, builders of roads, canals and bridges, and practical constructors of machinery were largely self-taught. A profession, as such, was virtually non-existent. With the advent of the railroad the whole course of economic history took a significant turn. Public works, manufacturing and mining were quick to feel the stimulus of mass transportation. Westward migration, hitherto restricted to the waterways, began to open up on a vast scale. At once there arose a demand for engineers versed in relatively exact arts of location and construction.

As the profession has grown, it has subdivided and its boundaries have become indistinct. It has very largely ceased to be a profession of individual service and has become one of corporate service. Industry has multiplied its technical functions, many of them sub-professional, but we lump them together loosely under the blanket term "engineering." Engineers are surrounded by hosts of draftsmen, detail designers, specification editors, inspectors, testers, instrument men, sales representatives, contractors, office managers and operating superintendents, and nobody knows where the profession begins or ends. The public has a high regard for the profession in the abstract, and shows great respect for its outstanding men, but has little regard for the rank and file that constitute the membership of the profession.

How definite is the engineering profession, and how well is it established in its relation to the community? Professor Wickenden presented an analysis of this question in a scholarly address before the American Society of Civil Engineers two weeks ago.

He arrives at the finding that the profession has no very distinct status, that it is becoming more undefined as its activities broaden, and that licensing has been of little service. To improve the status of the profession he suggests a new plan: society certification of engineers.

His analysis included a sketch of the profession's historical growth and of the rise of engineering schools, which are omitted in the accompanying abstract. The passages reproduced are representative of his discussion of present-day conditions. ***—Editor.***

While engineering has been gravitating toward the semi-professions, other more compact groups — lawyers, physicians, dentists and architects — have increased in solidarity, raised their qualifying standards, risen in public esteem; and have increased the special monopoly privileges which they enjoy under the law. As engineers, among the four national groups considered, we Americans have probably the least distinguished status as individuals.

Of professions there are many kinds: open profes-

sions like music, to which any man may aspire within the limits of his talents, and closed professions like medicine, which may be entered only by a legally prescribed process; individual professions like painting and group professions like law, whose members constitute "the bar," a special class in society; private professions like authorship and public professions like journalism, artistic professions like sculpture and technical professions like surgery. Despite these differences all these callings have certain attributes in common.

Since a profession must largely govern itself, it is assumed to maintain certain codes: (1) a code of qualifications governing admissions; (2) a code of ethical practices in relations with clients; (3) a code of professional honor in internal relationships; (4) a code of public obligations.

Professional status is an implied contract to serve society in consideration of the honor, rights and protection society extends to the profession. Through all professional relations runs a threefold thread of accountability, to colleagues, to clients and to the public.

The Professional Man's Responsibility

The obligations of a profession are so much a matter of attitude that codes alone are not sufficient to sustain them. Equal importance attaches to the state of mind known as professional spirit, which results from associating together men of superior type, and from their common adherence to an idea which puts service above gain, excellence above quantity, self-expression above pecuniary incentives and loyalty above individual advantage. The professional man cannot evade the responsibility to contribute to the advancement of his group. His skill he rightly holds as a personal possession, and when he imparts it to another he rightly expects a due reward in money or service. His knowledge, however, is to be regarded as part of a common fund; hence the obligation to publish researches and to share advances in professional practice.

The healing art is a realm of stratified professions—specialists of numerous sorts and general practitioners; physicians and dentists, laboratory technicians, pharmacists, optometrists, nurses, midwives, etc. One does not graduate from one level to another; he selects a particular calling, prepares himself for it specifically and follows it permanently. This definite grouping contributes greatly to professional standing. A physician is definitely a physician, and no one can escape the fact. As engineers, our traditions are precisely the reverse; between our ranks there exists a high degree of vertical mobility; our organizations have been inclusive in membership, and our education has aimed at the widest range of individual adaptability. In this sense we are the most democratic of all recognized professions. Is our attempt at extreme democracy worth its cost?

Licensing, as developed in other professions, is primarily for the protection of the public. People need the services of doctors, dentists and lawyers in personal emergencies when they are least able to discriminate between the competent, ethical practitioner and the shyster, quack or imposter. Incidentally, licensing tightens the monopoly of a profession and aids it in restricting accessions. How much protection does the public gain from the licensing of engineers? Some, undoubtedly, and perhaps much in the non-industrial areas where few persons have any real knowledge of engineering standards and personnel, and where individual practitioners and partnerships still predominate. Unlder these conditions the engineers receive much the same degree of protection as the public. Where engineering practice is largely corporate, rather than individual, licensing affords only nominal protection to either side. In structural practice, where the engineer comes into contact with the architect, it is essential that regulations imposed on the one shall not infringe the rights of the other. If one is licensed, it is fairly imperative to do the same for the other.

Our profession has little need of restrictive measures to curtail its numbers. The number of doctors or lawyers required per million of population is fairly inherent, but we are still far from the limit of society's capacity to use men who apply the resources of science to economic processes and utilities. As a means of raising professional standing the results of licensing have been practically negative. It may have kept out a few shysters who might have survived in a state of free competition, but it has left the general level of the profession unaltered.

Certification of Engineers

In conclusion, the speaker will limit himself to advocating one specific measure. It is in no sense a cure-all, yet it would help in some degree toward the solution of each of the problems which has been discussed. This measure is the certification of engineers by our major professional societies. I would favor keeping the profession open, and not make it a legal monopoly, and I would let licensing laws run their course until they find the level of their inherent limitations. I would keep out membership inclusive and not too rigidly graded, granting to engineers who pass into administrative duties the full fellowship of the profession. I would keep educational doors open in even greater variety, with a minimum of regulation and a maximum of guidance by the organized profession. But the profession needs more than an open association of like-minded men; it needs an inner nucleus of highly qualified men whose professional standing and standards the public cannot mistake.

A plan of certification by the profession is a task for many men to work out, and not for one. May I suggest, however, the following features:

1. Certification should be earned, and not granted as a mark of honor.
2. There should be a code of educational qualifications more advanced than mere graduation from college, yet obtainable by both college and non-college men.
3. These qualifications should be tested individually, not gaged by personal estimates and testimonials alone.
4. Educational qualifications should comprise scientific, technical, economic and civic knowledge of a mature order.
5. There should be a code of experience qualifications which would normally make the age of certification fall between 25 and 30.
6. The certification of graduates should be the goal to which the colleges and the professional societies should bend their influence. To this end the colleges should be encouraged to limit the award of professional degrees to those who have previously been certified.

Correction

In the article "Southfield Road Tunnel Failures, Detroit, Mich.," in the issue of *Engineering News-Record* for July 3, p. 16, a typographical error occurred in printing the name of one of the committee of engineers appointed to study the sewer failures. The name as printed was George H. Rubling, of Detroit. It should have been George H. Ruhling, of Detroit.

From Job and Office

Hints That Cut Cost and Time for the Contractor and Engineer

Paving Mixers Hitched Tandem Reduce Time Per Batch

By W. E. Barker
Highways and Municipal Bureau, Portland Cement Association, Chicago, Ill.

TWO 27-E pavers, hitched tandem, have reduced to 45 seconds the time required to turn out a batch of concrete mixed one minute on 4 miles of 40-ft. pavement being built in Cook County by Jaicks Bros., Chicago, contractors for the State of Illinois. The same batcher plant crew, the same hauling equipment and about six more men at the mixers are thus able to turn out about 50 per cent more concrete per day. Batches are dropped into the skip of the first mixer, run into the drum and

TANDEM PLANT MIXES ONE-MINUTE CONCRETE IN 45 SECONDS

mixed for 30 seconds, then discharged into the skip of the second mixer, which lifts them to the second drum, where they are again mixed for 30 seconds. Enough water is added to the batch in the first mixer to hold the materials together and prevent segregation during the transfer to the second drum. The operation of charging and discharging the second mixer requires about 15 seconds, so that the total time per batch is 45 seconds, compared with 75 seconds for a single mixer and one-minute mixing time.

The mixers are held rigidly a constant distance apart by a timber attached to the chassis of each by bolts and clamps. A rigid connection is essential because of the necessarily small clearance between the discharge chute of the first mixer and skip of the second. The discharge chute must overhang the skip as far as possible, else concrete will pile up in the end of the skip and overflow. And if the mixers came too close together, the rising skip would tear away the chute, even in its lowered position.

Materials are hauled from the batching plant by industrial railway. Eight-ton gasoline locomotives haul trainloads of 23 cars, or 46 batches. Three trains are required. Six men work on the batch boxes. One operates the crane that lifts these to a position over the mixer skip, three set the tongs and tip over the boxes, one strikes them with a wooden maul to dislodge any clinging cement or agregate, and one removes the covers from the cement compartments and loosens the sand on top of the boxes so that batches will dump easily. One man cleans the discharge chute of the first mixer so that partly mixed concrete will not drop onto the subgrade.

Six men level the concrete ahead of the finishing machine. One mechanical screen and a longitudinal float operated by hand from a staging set on four wheels that run on the forms do all the finishing. Two men operate the longitudinal float and edge the slab, completing the finishing.

Simple Soil-Bearing Test Performed at Akron Sewage Works

By A. B. Backherms
Sewerage Engineer, Akron, Ohio

IN BUILDING the several structures of the Akron, Ohio, sewage-treatment plant, whenever there was any doubt as to the ability of the earth to sustain the load to be imposed on it, and especialy in the refilled areas of the filters where unsatisfactory material was encountered at grade, a soil-bearing test was made. A total of ten tests was conducted primarily to determine whether or not fills had satisfactorily consolidated.

The test was made by carefully placing and leveling a 3 x 3-ft. x 3-in. platform on which a box 6 x 6 ft. x 3 ft. deep was set. The load was applied in increments, by depositing and leveling sand in the box. By virtue of the relative size of the box to platform, the actual load per square foot was four times the weight of the depth of sand per square foot in the box. A 4x4-in. post was rigidly fastened in the center of the box. The plotting board was placed adjacent to the post, but suspended from an independent crossbeam on which a multiplied index of the settlement for different loads was obtained.

The initial load was 1,010 lb. per square foot on the platform (represented by 20-in. depth of sand and the weight of the box) and it was allowed to stand for eight hours, the settlement being struck every hour and indicated by a line on the sheet of paper. This was followed by additional load increments of 5 in. of sand placed

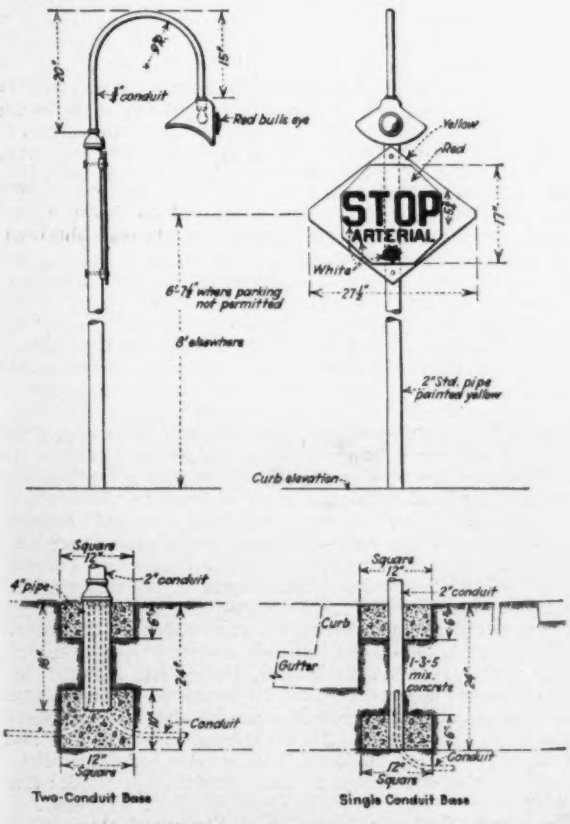
LOADING BOX FOR SOIL-BEARING TEST

at two- to three-hour intervals until the box was filled. The fully loaded box (1,600 lb. per square foot on platform or 1.6 times the actual load on filter floor) was permitted to remain another six to eight hours, at which time the test was discontinued.

Illuminated Arterial Stop Signs Reduce Crossing Accidents

THE CITY of Fresno, Calif., has in service 190 illuminated arterial stop signs which have shown excellent results in decreasing the number of traffic accidents at intersections. Not having sufficient funds for a traffic signal system, the city decided to install arterial stop signs of a sort that could be illuminated at night, thus making the signs appear to the motorist the same after dark as during daylight. By carefully designing support and reflector it was possible to make up the entire installation out of standard equipment, thus keeping the cost to a minimum.

In the two-conduit type the support begins in a concrete foundation with a 4-in. pipe which reduces at ground level to 2-in. conduit constituting the post carrying the sign proper. Above the sign another reducer provides rigid connection with the ¾-in. conduit that carries wires to the lamp and reflector. The reflector is equipped with a red bullseye so that in addition to illuminating the stop sign the approaching motorist gets the red warning signal with notable brilliancy even though the lamp used is only of 15-watt size. The plane of the stop sign makes an angle of 85 deg. with the curb line, thus bringing it squarely into the line of sight of the approaching motorist.



DESIGN AND ARRANGEMENT, ILLUMINATED ARTERIAL STOP SIGN

The total cost of these signs installed has varied materially, according to the facilities at the point where the installation is required. Where two signs—one on either side of an arterial highway—can be cut into the circuit of the standard multiple lighting system, the cost is only $12.50 per sign installed. Where the installation has to be adapted to a series lighting system the cost is about $25 per sign, and in outlying districts away from any lighting systems where a special service has to be run, involving meter, time clock for controlling the switches, etc., the average cost has been about $38 per sign.

At first a blinker was tried so the light would flash intermittently. While this was found more satisfactory than steady illumination as a means of arresting attention, the blinking feature was abandoned because of its interference with near-by radio receiving sets.

The signs have been installed under the supervision of Andrew M. Jensen, Fresno commissioner of public works.

Scheduling Reinforced-Concrete Beams and Joists

By W. R. Nelson

Of Harkness & Hertzberg, Structural Engineers, Toronto, Ont., Canada

THE type of schedule shown herewith was recently devised in this office and used in the structural design of the Canada Life Building, Toronto. It is thought that the method may be of interest to engineers, in that it combines a schedule of reinforcing steel with a picture of the member, thereby enabling the designer to check end conditions easily and giving in a very concise form all necessary information to concrete and steel contractors.

SCHEDULE OF REINFORCED CONCRETE MEMBERS

Note: 1. All detail dimensions in inches. End dimensions are to edge of concrete or to center of steel support. 2. Dimensions in feet and inches are clear spans for concrete and center to center spans for steel supports. 3. All members with same mark (No. J4, J4A, J5A etc.) differ only in span. 4. Stirrups same both ends unless noted.

Job_____
Architect_____
Engineer_____
Date_____

MEMBER				REINFORCEMENT			Notes	STIRRUPS		
Mk.	Width, in.	Depth, in.	Joist Centers, in.	Number	Size, in.	Supports		Diam., in.	Type	Distance apart starting from edge of support, in.
B1	12	22		2 2	¾ ϕ ½ ϕ	3'-0" 4" 6" 6'-4" 24" 6" 12'-6" 3'-0"		⅜		3, 6, 8
B2	14	28		2 2 4 2	⅞ ϕ ⅞ ϕ ⅞ ϕ ¾ ϕ	2'-0" 20" 20'-2" 20" 17'-10" 20'-10" 20" 6" 8" 15'-9" 3'-0"	24	½		L. 4, 8, 10, 10, 10 R. 3, 6, 9, 10, 12, 12
B3										
J3	5	10+2	25	2	⅝ ϕ	2'-6" 2'-12" 10'-2" 40"				
J4	5	8+2	25	2	¾ ϕ	3'-0" 24" 24'-10" 3'-0"				
J5	5	8+2	25	2	¾ ϕ	2'-7" 24" 24'-7" 3'-0"				
J4A						12'-6"				
J5A						13'				
						12'				

BEAM AND JOIST SCHEDULE

The schedule may be further simplified if it is assumed that spans will be taken from plans, in which case similar members of varying length will all receive the same mark, and notes Nos. 2 and 3 at the head of the schedule will be deleted.

Letters to the Editor

A Forum for Expression of Views by Engineers and Contractors

Cinder Concrete Barred by Many Cities

Sir—The editorial "Imperishable Framework" in your issue for May 15, 1930, is, I think, a bit misleading in its optimistic inference that cinder concrete, in general, is not injurious to steel. There are cinders and cinders.

Early steel-frame buildings, often cited as examples of durability, were generally built with the old-fashioned hollow tile floor arches and hollow tile fireproofing, laid in cement mortar, and not with cinder concrete. The old Waldorf-Astoria Hotel building, recently demolished, which your editorial cited as an especially good example of modern construction, did not have cinder-concrete floor arches or fireproofing, but was of hollow tile construction throughout.

At the present time in New York City cinder concrete is practically the only material used for floor construction and beam fireproofing in steel-frame building construction. Presumably cinder concrete made from properly selected and properly clinkered cinders derived from anthracite coal, such as is used in New York City, is a proper material for such purposes. Such cinder concrete may be non-injurious to steel embedded therein, and thus far seems to be standing the test of time (although I am not aware of any thorough-going investigation which has checked up this matter), but such is not the case with all cinders, notably those derived from certain bituminous coals in the mid-western part of our country.

In 1906-7 I was chairman of a special committee of the Engineers' Club of St. Louis and, simultaneously, of a joint committee representing the responsible local organizations of engineers, architects, fire underwriters and contractors. These committees carefully studied the question of cinder concrete in connection with the drafting of regulations governing reinforced-concrete design and construction, subsequently embodied in the building code of the city of St. Louis. Various members of those committees brought to light numerous instances of serious corrosion of steel embedded in cinder concrete in then existing local structures, and it was the unanimous opinion of all members of the committees that such corrosion was due to the direct attack of the cinders in the concrete upon the steel. There was also the further consideration that cinders, as commonly obtainable in that locality at that time, were so variable a material that it was doubtful as to just what constituted "cinders." Consequently the city of St. Louis, on recommendation of the above committees, excluded the use of cinder concrete entirely as a fireproofing or structural material, and that exclusion is effective, I believe, to this day.

It is interesting to note that Chicago, which derives its coal and therefore its cinders from the same general bituminous coal fields in Illinois as does St. Louis, while permitting the use of cinder concrete in fireproofing and floors under its building code, requires that "all steel and all metal pipe and conduits inclosed in cinder concrete shall be protected by a coating of cement grout or plastered with a good lime mortar before the cinder concrete is placed." Consequently, I believe, practically no cinder concrete is used in Chicago for structural purposes. Evidently those who drew that code were also convinced that the embedded steel should be protected against the injurious effects of direct contact with the cinder concrete of that locality. Other leading cities in other parts of our country (for example, Detroit, Cleveland and Los Angeles come to mind at the moment) also exclude the use of cinder concrete for floors and fireproofing under their respective building codes.

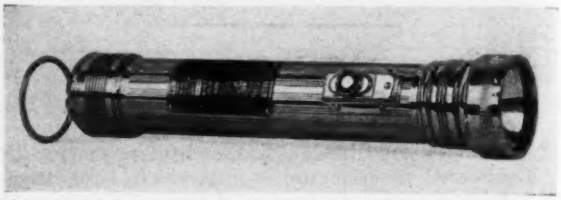
Perhaps it was in no small measure just such precautions on the part of those who framed our building codes that have resulted in the generally fine record of durability of our modern buildings, so enthusiastically proclaimed in your editorial.

H. C. TOENSFELDT,
Consulting Engineer.

New York, N. Y.,
June 18, 1930.

Electric Flashlights and Tunnel Explosions

Sir—After having read William Smaill's account of a tunnel explosion caused by an electric flashlight and your editorial comment on his article in the April 24 issue of *Engineering News-Record*, I wish to call your attention to



BUREAU OF MINES PERMISSIBLE FLASHLIGHT

the permissible type of flashlight illustrated herewith. In making up the official testing schedule covering flashlights, the U. S. Bureau of Mines considered not only the possibility of ignition of explosive mine atmospheres by the accidental exposure of the bulb filament and by electric sparks but also the possibility of accidental ignition of an electric detonator by contact with live parts of the lamp housing. The permissible flashlight is so constructed that all possible contacts on the outside of the lamp are of the same polarity; thus, unless the lamp is dismantled, no difference of potential can be obtained.

L. C. ILSLEY,
Electrical Engineer,
U. S. Bureau of Mines.

Pittsburgh, Pa.,
May 20, 1930.

Column Formula in New York Building Code

Sir—Messrs. Unger and Schulze, in their letter published in your issue of May 8 relative to the American Institute of Steel Construction's steel column formula which is now a part of the New York City building code, fail to understand the principles upon which this column formula is based. It is not the result of laboratory tests on miniature columns and test specimens alone, but of the study of the behavior of full-size columns under load and as actually fabricated in practice, as well as of a study of all available data on tests made on columns in the past.

When a steel column has a length equal to or less than its least radius of gyration times 50, the column tends to fail under load by shear. The ultimate unit shearing stress of such columns is practically constant. This is why the working unit stress of such columns—15,000 lb.—is permitted. This value is a percentage of the unit shearing stress at the yield point of the steel. When the length of a steel column exceeds its least radius of gyration multiplied by 50, the column tends to fail by bending, and a factor allowing for this bending tendency is introduced in the formula which will reduce the unit stress of 18,000 lb. accordingly.

The increased percentages quoted by Messrs. Unger and Schulze have no bearing on the permissible working values, for the reason that the straight line formula for steel columns does not, and never did, properly represent the behavior of such a column under stress, and does not take the shear into account. It was devised and used because of its simplicity and also because it gives working values well within the yield point of the steel and is therefore safe in application. On the other hand, while the form of Rankine formula now adopted is not strictly correct, it is, in the writer's opinion, nearer the correct formula than any other in use or proposed. It must be borne in mind that tests of full-size steel columns show that such a column will not begin to fail under a load much less than 25,000 lb. per square inch, and consequently there is ample safety between the unit values of 18,000 and 25,000 lb. when the design loads are not materially exceeded.

The writer agrees with Messrs. Unger and Schulze that only competent engineers should be permitted to design steel construction, and if they will examine the fully proposed amendment as written by the committee, they will find that an attempt has been made by it to provide for other conditions governing the design of steel construction besides that of wind.

E. L. VERVEER,
Structural Engineer.

Lyndhurst, N. J.,
May 17, 1930.

News of the Week

Detroit Votes to Recall Mayor

At a special election in Detroit on July 22 the citizens voted in favor of the recall of Mayor Charles Bowles by a majority of about 31,000. More than 200,000 went to the polls to cast the heaviest vote ever cast in a special election in the city. This was the first instance of the recall in a city of the population size of Detroit.

Among the charges against Mayor Bowles were that he destroyed efficient public service by dismissal of faithful employees. As stated in *Engineering News-Record*, April 17, 1930, pp. 635 and 665, he replaced John W. Reid, commissioner of public works and an engineer in the employ of the city for 30 years, by John Gillespie, a non-engineer and formerly head of a surety company that bonded contractors on a sewer that collapsed recently. On his appointment Mr. Gillespie immediately ousted the city engineer, Perry Fellows, but the latter appealed to the courts and was reinstated by the civil service commission. Disruptive acts of the mayor in respect to the transit commission and the management of the municipal street railway system also contributed to the public resentment that led up to the recall election.

Natural Gas Explosion Kills 12 in Hetch Hetchy Tunnel

An explosion of natural gas killed twelve men, the entire crew, in the east heading of the Mitchell shaft in the Coast Range tunnel of the San Francisco Hetch Hetchy water-supply project on July 17. The crew of 21 at work in the west heading at the time of the explosion made their way to safety up the 800-ft. shaft. Investigations were started immediately by the city, the state industrial accident commission and federal agencies.

The blast is estimated to have occurred about 900 ft. east of the shaft, which is one of the five intermediate openings on the line of the 28-mile tunnel through the Coast Range, the last mountain barrier on the aqueduct line to bring a new water supply to San Francisco. The material encountered is a sedimentary formation and the occasional presence of gas is guarded against by safety equipment and regulations. These include no smoking, double guards on the electric light globes, and gas test lamps supplied to each shift boss.

The exact cause of the explosion probably never will be determined, since the entire crew was killed. Possible causes which have been advanced include a broken light globe, sparks from a motor or an infraction of the smoking rule at the time when a gas pocket was encountered.

Senate Adjourns Without Confirming Power Commission

Names of Three Appointees Sent In by President Hoover—Sketch of Their Activities

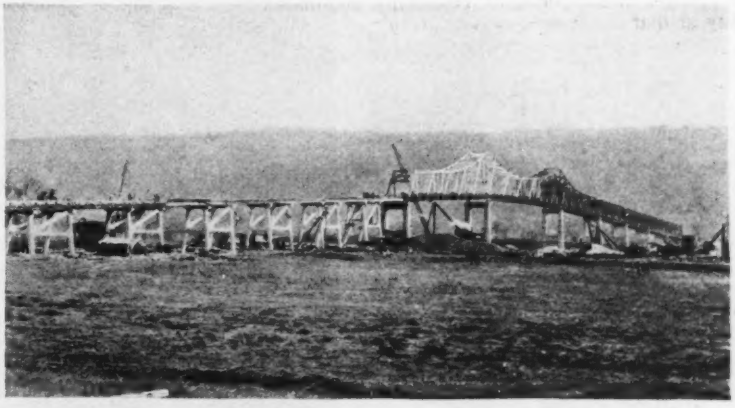
THE SENATE adjourned July 21 without confirming the nominations of the three men selected by the President for the reorganized Federal Power Commission. Marcel Garsaud, a New Orleans engineer, was selected for the three-year term; Ralph D. Williamson, attorney, of Yakima, Wash., was selected for the two-year term, and Claude L. Draper, of Cheyenne, Wyo., was chosen for the one-year term. The three nominations were reported favorably by the interstate commerce committee, but objection to immediate consideration was raised by Senator Walsh, of Montana, and by Senator McKellar, of Tennessee. Under the rules, nominations must lie on the table for one day. The Senate, having disposed of the treaty, was not willing to defer final adjournment longer.

Recess appointments may be precluded by the language of the act. An opinion from the attorney-general may be necessary to clear up that point. In case it is decided not to make recess appointments, the President stated that the secretaries of war, interior and agriculture will have no difficulty in continuing to administer the affairs of the commission.

Mr. Garsaud's Career

Mr. Garsaud was born in Bordeaux, France, 49 years ago and was brought to New Orleans by his parents when he was twelve years of age. He was educated in the New Orleans public schools, at Soule College and at Tulane University, where he was graduated in 1903 at the head of his class. His first work as an engineer was in Point Coupee Parish on the Texas & Pacific Railroad. Later he did engineering work for the Louisville & Nashville in Alabama. Following that service, he joined the technical staff of the sewer and water board in New Orleans as assistant engineer. He worked up to become a special assistant next in rank to George G. Earl. His work was largely design and construction. He helped design the present filtration plant in New Orleans. In 1908 Mr. Garsaud embarked in the private contracting business and was associated for two years with A. L. Patterson & Co. Then he joined the staff of Hampton Reynolds and designed and built reinforced-concrete bridges in southern Louisiana. He served as an adviser to the city government and was a member of the building code board of appeals.

On the outbreak of the war Mr. Garsaud went to the training camp at Fort Leavenworth. He was one of the



HIGHWAY BRIDGE OVER TENNESSEE RIVER

A new bridge over the Tennessee River at Scottsboro, Ala., which was recently completed, involves a 760-ft. continuous span for the river crossing and four 200-ft. simple spans. The 700-ft. north approach to the bridge was constructed with treated wood pile bents, with 30-in. I-beam stringers and a reinforced-concrete deck. The 580-ft. approach from the south consists of concrete towers, I-beam stringers and concrete deck. According to the Kansas City Bridge Co., which built the structure, excavation for the eight main piers, seven of which were constructed by the pneumatic process, was one of the most difficult parts of the job, as it was almost entirely through a hard conglomerate formation. The pier foundations consist of two cylindrical steel caissons sunk 25 to 60 ft. below water to bedrock. The bridge is owned by the Alabama State Bridge Corp.

two members of the 6th Engineers selected for the rank of major and was assigned to the 312th Engineers. Later he became lieutenant-colonel of the regiment. He organized and constructed the utility services at Camp Pike. On arriving in France, Col. Garsaud was assigned to the field officers' school at Langres. Thence he was sent as engineer observer with the 1st Engineers. Following the armistice he was assigned to the 103d Engineers, a Pennsylvania regiment. He assisted in the transfer of the $400,000,000 worth of war material sold to France.

Returning to New Orleans with the completion of his assignment in France, he entered into partnership with Allen Hackett to do a general contracting business. He also was made chairman of the committee which revised the New Orleans building code. In 1924 Mr. Garsaud became the chief engineer of the Orleans levee board. Since that time he has been in close touch with the flood-control program. He sat with the federal spillway board and frequently was consulted by army engineers in connection with the flood-control plan. The initial plans for the $27,000,000 lakefront reclamation project at New Orleans were formulated by Mr. Garsaud. He was general manager of the board of port commissioners until October, 1929. Since that time he has been engaged in private practice.

Indorsed by Am.Soc.C.E. President

Mr. Garsaud's name has been under consideration by the President for several weeks. Despite the fact that he was indorsed unreservedly by John F. Coleman, president of the American Society of Civil Engineers, and by American Engineering Council, his appointment was opposed in some quarters on the ground that he was an intimate friend of Lieut-Gen. Edgar Jadwin, who at that time was slated to be chairman of the reorganized Federal Power Commission.

The Other Nominees

Mr. Draper is the chairman of the public service commission of Wyoming. He has served on that commission under three state administrations.

Mr. Williamson is an attorney who has specialized in reclamation matters and who is said to be very familiar with the hydro-electric resources of the Northwest.

New Jersey Cities Combine to Purchase Water System

Three New Jersey cities, Paterson, Passaic and Clifton, have agreed to join in a tri-city pact by which the Passaic Valley Water Commission will acquire the holdings of the Passaic Consolidated Water Co. at a compromise price of $13,000,000. The condemnation board awarded the company $14,000,000, and from this award both the cities and the company took an appeal. Finally, however, a compromise was effected for the price named.

Maryland Bridge Collapse Attributed to Overstressing of Damaged Members

Verticals Bent in Prior Accident Failed Under Heavily Loaded Truck—Posted Weight Limit Exceeded

FAILURE of a highway bridge over the Monocacy River near Frederick, Md., on June 19 (*Engineering News-Record*, June 26, p. 1069), is attributed to the buckling of two vertical posts already damaged in an accident which took place some time in the past, in a report submitted to the Maryland state roads commission by the J. E. Greiner Co., consulting engineers. The accident resulted in the death of three men and the injury of seven others.

The structure which was destroyed was the western half of a two-span pin-connected through Pratt truss bridge built in 1889 by the King Iron Bridge Co. Each span was 153 ft. long and comprised nine 17-ft. truss panels. The floorbeams were suspended from the trusses by yokes; the stringers rested on top of the floorbeams. The material was wrought iron; although light, it was in good condition and had not been seriously weakened by corrosion. At the time of the accident workmen were engaged in strengthening the floor system. Reinforcement of the vertical truss members was in prospect, but this part of the work had not been started. There is no evidence that the repairs had weakened the structure. However, the contractor had on the bridge two pieces of heavy equipment—a compressor outfit mounted on a motor truck, total weight 5.8 tons, with rear wheels at point L_2; and an industrial tractor weighing 4,200 lb. between the compressor unit and the abutment L_0. With this equipment in place a heavy truck loaded with gravel (gross weight 24,000 lb.) started across the bridge from the L_0 end. This was said to be traveling at a speed of approximately 10 miles per hour. A workman standing on the structure reported that he heard a tearing sound overhead when this truck passed the compressor unit. The truck continued almost to the pier

WRECKAGE OF COLLAPSED BRIDGE NEAR FREDERICK, MD.
Sign reads: Warning—weight not to exceed 14,000 lb. Speed not to exceed 15 m.p.h.

at L_5, the last end of the span, before the failure occurred. The two trusses fell almost simultaneously, so that the entire west span dropped straight downward, the midstream end resting against the pier so that the truck rolled backward into the wreckage. The shore end of the span, at L_6, fell completely clear of the abutment without scoring it. This was the expansion end of the truss. The top chord members U_3-U_5 were later found to be turned end for end and upside down in the wreckage.

An inspector who had looked over the bridge before repairs were begun reported that he found the vertical members U_3-L_3 on each truss of the span bent out of line at a point just above the top of the handrail as the result of a collision which had occurred on the bridge some time before. These members each consisted of two 8-in. channels, laced. The deflection of the channels from normal he estimated at 1 in. and 3 in., the inner channel being bent more than its companion in each of the two trusses. There is also evidence of an old tear in the flange of one of these channels, probably a result of the same accident. Assuming these deflection figures to be correct and taking both compression and bending moment into account, calculations show that the maximum stresses in the two vertical members U_3-L_3 slightly exceeded the elastic limit of the wrought iron at the instant of maximum loading. It is therefore believed that the initial failure occurred in these members at the time the truck crossed the point L_3, where the compressor was placed.

Signs posted at each end of the structure limited loads to 14,000 lb. and speeds to 15 miles per hour. It is interesting to note that the driver of the truck testified that he had already crossed the structure under exactly similar conditions twice previously, once on the day of the accident and once on the day before.

Oklahoma City Reorganizes Its Engineering Department

In accordance with his announced plan of reorganizing the engineering department of Oklahoma City, Okla., George F. Brown, city engineer, has appointed Tom G. Banks to be construction superintendent of the department and W. W. Hughes to be assistant office engineer, the latter filling the post made vacant by the removal of Harry V. Becker. Mr. Banks has been district engineer for the Missouri, Kansas & Texas Ry. and was formerly city engineer at Denison, Tex. Mr. Hughes was formerly city planning engineer of Oklahoma City.

Believing that some employees have been engaged in the same kind of detail work too long, Mr. Brown announces that several of them will soon be assigned to different work but that none of them will be discharged. The position of engineer for the planning department is still unfilled.

Maine to Build Suspension Highway Bridge

Substructure bids will be received July 29 for a state suspension bridge over the Penobscot River to connect Waldo and Hancock counties, Maine. Superstructure bids are to be opened Aug. 26. The bridge will have a main span of 800 ft. and side spans of 350 ft. each, and will carry a deck about 30 ft. wide having a 20-ft. roadway and two sidewalks. One pier will be founded on rock, the other on hardpan. The two cables will be built of fabricated strands.

The bridge is being built for a special state commission and will be a toll structure. Robinson & Steinman, New York, are the engineers. Completion is expected by Sept. 1, 1931.

Foundation Failure Wrecks Large Gasoline Storage Tank

While being tested four-fifths full of seawater, a 120,000-bbl. gasoline storage tank at the Texas Co.'s South Portland, Me., refinery settled about 10 ft. in a few minutes on July 18, wrecking the tank. Near-by territory was flooded, but damage was not serious, since the water ran out slowly from a rupture near the top ring girder. Failure was apparently caused by foundation soil settlement.

The tank, of flat-bottom type, was 144 ft. in diameter with a shell height of 40 ft. The foundation, a ring of concrete about 5 ft. square in cross-section, was built on a clay-sand subgrade about 75 yd. from tidewater. The settlement occurred on the uphill side of the foundation. Soil tests made prior to construction of the tank yielded satisfactory bearing results, according to the Texas Co. engineers. Further tests are to be undertaken if the tank is rebuilt. Officials of the city of South Portland, who have the question of re-issuing a building permit for the tank before them, are visiting refinery centers in the East to determine what requirements are necessary to assure public safety in large tank construction. The tank was built by the Petroleum Iron Works of Sharon, Pa., and was accepted by the Texas Co. last spring.

Report Charges Highway Wastes in Cook County

Severe criticisms of Cook County's highway contracting methods are made in the report of a citizens' committee appointed by the Chicago Association of Commerce and financed to the extent of $75,000 by the county commissioners. It is charged that costs were excessive when compared with state work, that often many ineligible bids above the engineer's estimate were received and only one or two eligible below the estimate, that bids and purchases of bituminous material did not agree, and that large quantities of material were brought on consecutive orders for slightly less than $500, the maximum that can be let without first receiving bids.

The investigation covered the period from Jan. 18, 1927, to June 30, 1929, and has taken a year. William R. Dawes, former president of the association, was chairman of the citizens' survey committee. Haskin & Sells were the accountants, and Ford, Bacon & Davis did the engineering work.

Excessive cost of contract work when compared with state work amounts to $1,330,000, according to the report, crushed stone and gravel cost $195,000 too much, and bituminous surfacing $64,000. Charges are made that lack of competition had a serious effect on cost, widespread and adequate notice of lettings was not given, bids were rejected without recording the reasons therefor, and other than the low bidder received awards.

German Bridge Fails

Overcrowding of a wooden footbridge across an arm of the Moselle River opposite Coblenz, Germany, during a celebration on July 22 resulted in the sudden failure of the structure. It is reported that more than 40 persons were killed and a number injured in the accident.

Electric Pumping to Irrigate 170,000 Acres in Arizona

Power for electrical pumping of water to irrigate additional agricultural lands in Arizona has been arranged for under a contract recently concluded between the Arizona Edison Co. and the Salt River Valley Water Users' Association, both with headquarters in Phoenix. The lands lie about 25 miles south of Phoenix, Tempe and Mesa, and the total area eventually to be irrigated will amount to about 170,000 acres. By the terms of the contract the company will serve the pumps with power bought from the Water Users' Association, which will build the necessary power lines and substations for the power company.

The extension program will involve the building of a 110-kv. transmission line at an estimated cost of $188,725; a transformer substation at the terminus of the 110-kv. line at an estimated cost of $126,000; a 44-kv. transmission line approximately 23 miles long, estimated cost $85,000; a transformer substation estimated to cost $41,500; a 44-kv. line about 12 miles long, estimated cost $41,500; switching and protective equipment at an estimated cost of $25,000.

Bridge Will Open New Railroad Into Mexico

Construction of an international bridge across the Rio Grande at Presidio, Tex., has been begun by the Santa Fe Railroad. With the completion of this bridge and the laying of rails on the south end of the present extension being built from Paisano Pass, immediately west of Alpine, Tex., to Presidio, a new railroad will be opened from Texas into western Mexico.

Plans Completed for Bridge Over Ottawa River

Plans have been completed for the erection of a high-level bridge over the Ottawa River from Hawkesbury, Ont., to Greenville, Que., at a cost of $400,000. The span will be 400 ft. long and the engineers estimate that the work will take about a year. The new span will be the first bridge to be erected between Ottawa and Montreal, with the exception of a short span at St. Anne's.

Commission Refuses Permission for Coke-Oven Plant Sale

The New York Public Service Commission has denied the petition of the Brooklyn Union Gas Co. for consent to sell its newly erected $16,000,000 coke-oven plant at Greenpoint to the Brooklyn Coke and By-Products Corp., a subsidiary of the Koppers Co. In its decision the commission states that approval of the plan for the sale would greatly curtail the jurisdiction of the commission over the plant and impair its regulatory powers. "The petitioner," states the decision, "requests the Public Service Commission by its own act to place beyond its jurisdiction a gas plant already in existence and now subject to its jurisdiction."

Louisiana Highway Commission Hit by Economy Wave

As the result of an economy program, Harry B. Henderlite, chief engineer of the Louisiana highway commission, M. J. D'Autremont, assistant to the maintenance engineer, nine of the fifteen right-of-way men, and eight or ten stenographers have been dismissed. The announcement is also made that within 60 days there will be a further cutting of the highway force by between 500 and 700 men and women employees. Mr. Henderlite succeeded L. R. Ames, who resigned in June, 1929, because he was not allowed to pursue his work untrammeled by political interference.

W. H. Norckauer, who has been representing the highway commission before the federal roads bureau in Washington, has been recalled and appointed chief to succeed Mr. Henderlite.

$5,000,000 Road Improvements Under Way in Montreal

To relieve congestion and facilitate traffic conditions at the approaches to the Island of Montreal, the Quebec highways department is undertaking road improvements involving an expenditure of $5,000,000. The most important feature of the program announced by the department is a 150-ft. boulevard connecting the highways on the south shore of the St. Lawrence with the new Montreal harbor bridge. The boulevard, to be known as the Laprairie-Montreal Boulevard, is to be 9 miles long.

The Business Outlook

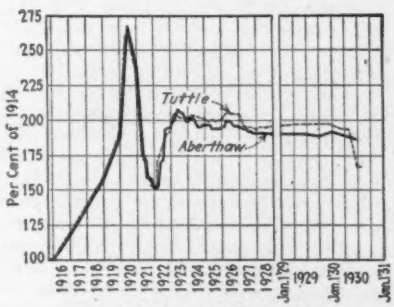
The passing of the mid-year spurt has left business facing the full force of the usual July slackness, now emphasized by a depression year. Activity in the basic industries, excepting building construction, is at a low level. General trade has also slackened somewhat, but continues well sustained in comparison with production. Commodity prices, except in key agricultural products, show greater steadiness. Little improvement may be expected during the rest of the month.
—The Business Week, July 23.

Low Building Prices in New England

The accompanying chart shows index numbers of building costs that have been computed by two Boston contractors since 1915. The Aberthaw index is based on a typical reinforced-concrete factory built at New Britain, Conn., in 1914; 200x62 ft., seven stories, 88,000 sq.ft. The 100 base is actual cost of the building. "It is brought to date quarterly," says S. L. MacMillan, "by making a new estimate which takes into consideration not only actual variations in cost of materials but also changes in labor rates, labor efficiency and any other condition that might affect cost."

The Morton C. Tuttle index, according to C. W. Mayers, is normally changed "only so far as it may be affected by current changes in general material quotations and building trade wage rates."

In general the two curves are seen to agree remarkably well. The sharp drop of the Tuttle index in June is explained by Mr. Mayers by the fact that keen competition among general contractors, due to smaller volume of work, has compelled lower materials and subcontract prices. He continues: "Today the price of buildings has no definable relation to fair cost value. Accordingly, it is not possible to project the Building Index month by month, as we have done in the past fifteen years." Therefore, he says, the June figure of 166, compared with 194 in May, "reflects the present cost of construction work as compared with a pre-war basis of 100." The condition is due not only to lower prices but also to the higher efficiency made possible by a picked labor force and competition.



BUILDING INDEX NUMBERS OF TWO BOSTON CONTRACTORS

The Aberthaw index for June, 1930, figured by the usual method, is 187, compared with 188 in May. According to this index, building costs have dropped nearly 3 per cent since Jan. 1. This checks closely with the course of general construction costs for the whole country, *Engineering News-Record* Construction Cost Index having dropped 4 per cent in the six months.

Engineers to Report on Power Development of Los Angeles

Approval has been given by the Los Angeles board of water and power commissioners of the three engineers selected by the Chamber of Commerce to make a survey and report on the city's proposed power development program from an engineering standpoint. The bureau of power and light wishes to place on the ballot at the primary election, Aug. 26, a measure authorizing a bond issue of $19,000,000 as a part of a tentative three-year financial program totaling $31,000,000, of which $12,000,000 is to be derived from power revenue.

The engineers chosen are W. F. Durand, emeritus professor of mechanical engineering, Stanford University; R. W. Sorensen, professor of electrical engineering, California Institute of Technology; and A. V. Guillou, assistant chief engineer of the California railroad commission.

Importation of Russian Lumber Opposed as Convict-Made

Importation of Russian lumber is being closely watched by the National Lumber Manufacturers Association and the American Federation of Labor. Both organizations were in conference recently with Seymour Lowman, assistant secretary of the treasury, in regard to the admission of six cargoes of lumber consigned to concerns in Providence, R. I., and Poughkeepsie, N. Y. Notwithstanding the objections, Mr. Lowman ordered the admission of the lumber.

In consequence of this ruling, both organizations named have submitted briefs protesting against further admission of lumber from those regions of Russia in which convicts are engaged in logging and sawmills. Their protest is based on section 307 of the tariff act of 1930, which bars the importation of products wholly or partly manufactured by convict labor. The lumber association's brief insists that the enforcement of this provision is not discretionary with the secretary and presents documentary evidence designed to show that convict labor is being extensively used in lumbering operations in the areas in Russia from which lumber is now being shipped to the United States.

Construction Due for Upturn in Next 6 Months

Judging From Public and Private Capital Issues, Volume of Projects for the Whole of 1930 Will Equal Last Year's

CONSTRUCTION has remained below expectations throughout the first half of 1930, despite excellent budgets of work to be done. What are the prospects for the second half?

It is known from long comparisons that contracts follow the issuance of new securities for constructive purposes by about four months (*Engineering News-Record*, Nov. 7, 1929, p. 729). Therefore the volume of new capital issued will throw light on construction prospects for the second half of this year.

In 1929 the total issued by public and private corporations amounted to $12,440,000,000, but only $6,627,000,000 was for domestic capital investment, including structures, machinery and transportation. The remaining $5,813,000,000 was distributed as follows: refunding, 24 per cent; Canadian and foreign, 12; investment trusts, holding companies, 38; miscellaneous non-productive, 26 per cent.

Public bonds are practically 100 per cent for construction, not more than 1 per cent being refunding. They are issued in general by cities and towns, 60 per cent; counties, 20; school districts, 10; states, 10. The total value of the 1928-29 issues of both long- and short-term bonds was $4,452,000,000 for the two years. The value of public-works contracts recorded by *Engineering News-Record* from May, 1928, through April, 1930, the period when most of these bonds were being translated into construction, was $2,225,000,000, or 70 per cent of the total security value.

Sales of long-term public bonds for the first six months of 1930 totaled 754 millions, compared with only 670 in 1929, 778 in 1928, 883 in 1927, and 749 in 1926. Monthly sales in millions of dollars of both long- and short-term bonds were as follows:

	1930	1929
January	201	188
February	161	161
March	329	164
April	232	192
May	152	240
June	195	210
	1,170	1,155

These funds have been drawn on only for May and June contracts, whose value was 4 per cent above that of May and June, 1929. January-February bond sales were above those of the preceding year by about the same margin. Third-quarter prospects are indicated by the fact that bonds have been sold (March-June) to the value of 808 millions, compared with 806 in 1929 and 754 in 1928.

Thus public construction may be expected to hold at least a part of its present lead of 12 per cent during the next three months.

Private corporation securities issued for capital-investment purposes totaled $4,400,000,000 in 1929, and contracts reported in the twelve months, May, 1929, to April, 1930, totaled $2,597,000,000, or 59 per cent. Monthly issues in millions of dollars this year and last compare as follows:

	1930	1929
January	527	554
February	359	467
March	465	383
April	508	387
May	817	586
June	456	236
	3,132	2,613

Thus, with this increase of 20 per cent, the prospects for a larger volume of construction in this half of 1930 are bright. New capital issues in the four months, March to June, totaled 41 per cent more than in those months of 1929. Private contracts in July-October, 1929, totaled 781 millions, compared with 705 millions in that period of 1928, a gain of 11 per cent. A similar gain this year over last for the next four months will decrease the present half-year deficit in this class of 29 per cent to 16 per cent, with the possibility of no deficit at the close of the year. Taking public and private engineering construction together, then, the outlook is for an even break with last year. And last year exceeded 1928 by 10 per cent and 1927 by 9 per cent.

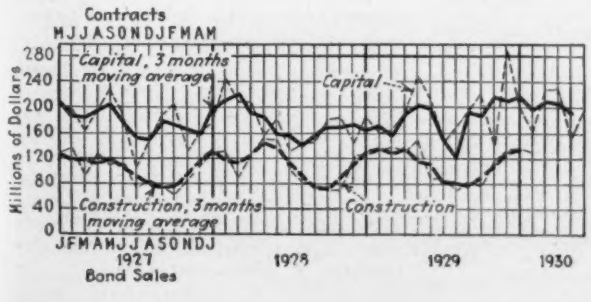
Employment—There are no accurate figures of the number of wage workers in the construction industry. That 900,000 men are directly employed on public construction alone is stated in the report of the Committee on Recent Economic Changes issued July 3, 1930. As the annual program of public works totals $3,500,000,000, the employment ratio is 0.000257 man per dollar, which seems to be high and suggests that many

TABLE I—NEW CAPITAL AND CONSTRUCTION CONTRACTS IN MILLIONS OF DOLLARS

Giving for four-month periods of 1927-30 the value of new public and corporate securities and the value of engineering-construction contracts for similar periods but four months later, and in each case the ratio of contracts to capital. This ratio is 60 to 70 per cent.

New Capital Issues			Contracts Let Four Months After Issue of Capital				
Periods	Public	Corporation	Public	Per Cent of Bonds	Private	Per Cent of Capital	Periods
1927							
Feb.-May	775	1,364	530	68	674	49	June-Sept.
June-Sept.	637	1,039	367	58	719	69	Oct.-Jan.
Oct.-Jan.	665	1,227	458	68	795	65	Feb.-May
1928							
Feb.-May	818	1,081	529	65	704	65	June-Sept.
June-Sept.	601	1,018	458	76	835	82	Oct.-Jan.
Oct.-Jan.	699	1,915	420	60	1,091	57	Feb.-May.
1929							
Feb.-May	766	1,823	557	73	755	41	June-Sept.
June-Sept.	719	1,390	375	52	593	43	Oct.-Jan.
Oct.-Jan.	855	1,241	498	58	812	65	Feb.-May
1930							
Feb.-May	773	2,149	...	..	...	..	June-Sept.
June	144	....	...	..	...	..	Oct.

PUBLIC BOND SALES AND CONTRACTS (BELOW) AND PRIVATE CORPORATION CAPITAL ISSUES AND CONTRACTS (AT RIGHT) WITH CONTRACTS PLOTTED FOUR MONTHS BEHIND MONEY



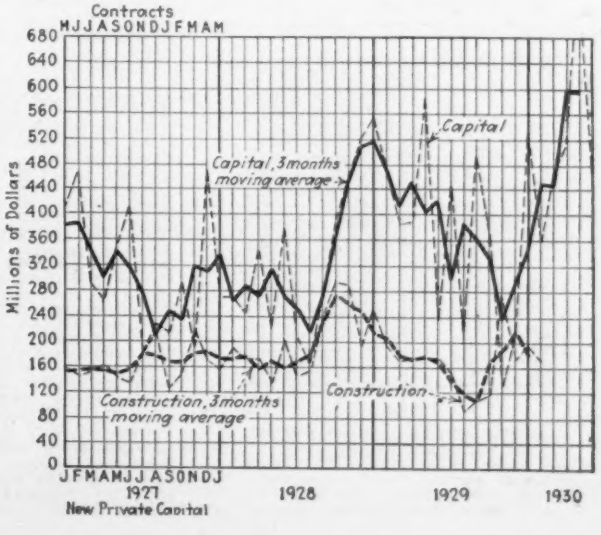


TABLE II—MEN PER CONSTRUCTION DOLLAR

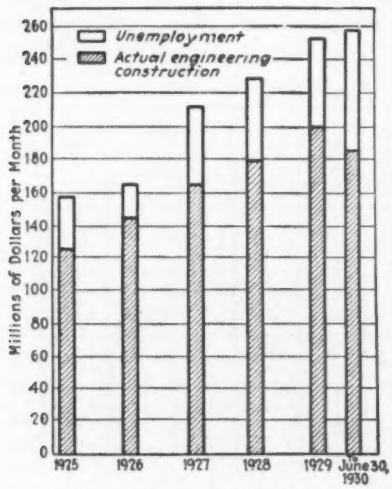
	Construction* Except Highways Est. Actual†	Absolute	Wage Workers* in the Industry†	Per Cent Unemployed†	Man Per Thousand Dollars Value	Volume
1920	3,338	1,330	850	25	0.204	0.64
1921	3,069	1,520	849	27	.218	.56
1922	4,330	2,480	1,091	21	.209	.44
1923	4,768	2,220	1,162	17	.206	.52
1924	5,237	2,440	1,230	26	.187	.51
1925	6,662	3,220	1,467	21	.181	.46
1926	6,902	3,320	1,449	18	.179	.44
1927	6,787	3,290	1,421	27	.164	.43
1920-7	.....	....	....	..	.190	.48

*In thousands, 000 omitted.
†Prof. W. I. King, in "Recent Economic Changes."

salaried workers are included. Using the 1927 absolute volume unit 0.00043 (Table II) gives 727,000 wage workers on public-works construction and 1,502,000 on private construction, a grand total of 2,229,000 wage workers attached to the construction industry.

An annual construction volume of $3,500,000,000 public plus $7,250,000,000 private, or $10,750,000,000, would absorb 100 per cent of the present wage workers of the construction industry. This is a monthly average of 292 millions public and 604 private, or 896 total.

In 1929 *Engineering News-Record* recorded an average of 112 millions per month public (40 per cent of the year's total) and 217 millions private (45 per cent), or 329 per month (43 per cent) for both. Complete employment would be indicated by engineering-construction figures of 117 public and 272 private, or 389 total per month. For the first half of 1930 the average figures were 122 public and 186 private. Thus there should be no unemployment on public work, but 31.5 per cent unemployment on private construction. A. F. of L. average unemployment for this period is 39 per cent. The expected rise in construction volume during the remainder of the year will materially decrease unemployment.



CONSTRUCTION VOLUME AND UNEMPLOYMENT

Hatched columns show actual engineering construction, open columns show unemployment.

Personal Notes

R. M. ANDERSON, of Cleveland, who for a number of years has been connected with the construction department of the Standard Oil Company of Ohio, has been named construction engineer in the division of safety and hygiene of the Ohio industrial commission.

RODNEY L. BELL, of West York, Ill., has been appointed assistant to the chief highway engineer for the Illinois state highway department.

H. M. FREEMAN, partner in the civil and consulting engineering firm of Freemen & Winston, of West Orange, N. J., retired from the firm on June 1. Charles A. Winston, the other member of the partnership, will carry on the business under the old firm name.

LOUIS MITCHELL, dean of the college of engineering at Syracuse University, Syracuse, N. Y., who has served for seven years on the Syracuse grade-crossing commission, has resigned from the commission because he can no longer devote the time required to the details of track elimination without interfering with his duties at the university.

WARD P. CHRISTIE, for the last ten years staff engineer of the Associated General Contractors, recently resigned his position to become connected with Ulen & Co., and will be located at the principal offices of the company at Lebanon, Ind. Mr. Christie is a graduate of Purdue University, class of 1915.

W. B. PALMER, of Bridgeport, Conn., announces the organization of the W. B. Palmer Engineering Co., specializing in hydraulic and municipal engineering and real estate development, paying special attention to water-power development, town planning and allotments. Mr. Palmer, who was graduated from Sheffield scientific school in 1876, for the past 30 years has been in private practice.

HARRY R. FITTON, of Indianapolis, formerly of Mothershead & Fitton, Inc., architects, has opened an office in Indianapolis for the practice of architecture and will also conduct a general construction company. He has been engaged in the construction business for 23 years.

H. R. EDWARDS, assistant engineer in the office of the city planning commission, Columbus, Ohio, has been promoted to engineer in charge. He fills the vacancy created by resignation of Ralph C. Chaney, who several months ago accepted a similar post with Cuyahoga County planning commission at Cleveland.

ALBERT B. STEVENS, a graduate of the University of California, has been added to the faculty of the University of Southern California as instructor in general engineering. He will give courses in engineering drawing, mechanics and materials, and will also assist Prof. John F. Dodge in the division of petroleum engineering. Mr. Stevens has been engaged in drafting, scouting and field work in cementing of wells.

Obituary

STEPHEN DAY, of New Albany, Ind., founder of S. Day & Sons, contractors, died on July 18, at the age of 88. He began his contracting career 42 years ago.

EDWARD HOLLIDAY AMES, a retired contractor and former assistant engineer in charge of sewers for Columbus, Ohio, died on July 20. He retired in 1922 because of ill health. He was a graduate of the college of civic engineering, Ohio State University.

WALTER B. FAIRFIELD, 82 years old, who before his retirement some years ago had been a member of the U. S. Coast and Geodetic Survey for more than 50 years, died on July 20 in Morristown, N. J.

JAMES M. COLEMAN, of Montreal, died in that city on July 13 in his 70th year. Mr. Coleman was for many years head of the car department of the Canadian National Railways and was the inventor of a locking device which aimed to prevent the telescoping of passenger cars in a railway collision.

BRIAN D. MCCONNELL, engineer and pioneer railway builder, died at North Bay, Canada, on July 13, at the age of 94. At one time Mr. McConnell was engaged in the construction of the Canadian Pacific Railway and afterward practiced his profession in Montreal. He was superintendent of the Montreal water-works for thirteen years, and afterward became the city engineer of Westmount, Que.

Society Calendar

AMERICAN IRON & STEEL INSTITUTE, New York City; semi-annual meeting, New York City, Oct. 24.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; fall meeting, St. Louis, Mo., Oct. 1-3.

AMERICAN WELDING SOCIETY, New York; fall meeting, Chicago, Sept. 22-27.

NATIONAL SAFETY CONGRESS, Chicago; annual meeting, Pittsburgh, Pa., Sept. 29-Oct. 3.

CONCRETE REINFORCING STEEL INSTITUTE will hold its semi-annual meeting at Briarcliff Lodge, N. Y., Oct. 20-22.

GEORGIA SECTION, American Society of Civil Engineers, met on July 14 and listened to a paper on "Combinations of Steel and Concrete" read by George L. Reed, regional structural engineer of the Portland Cement Association.

LOUISIANA ENGINEERING SOCIETY on July 21 gave a testimonial dinner to Senator Joseph E. Ransdell in recognition of his success in securing passage of the bill to establish a national hydraulic laboratory. The engineers of the local New Orleans chapters of the American Society of Civil Engineers and of the American Society of Mechanical Engineers united with the state society in honoring Senator Ransdell.

WASHINGTON STATE GOOD ROADS ASSOCIATION will hold its annual convention on Nov. 21-22 in Wenatchee.

WISCONSIN SECTION, American Water-works Association, will hold its ninth annual meeting in Superior on Aug. 21 and 22. Opportunity will be given to inspect the water-works at Superior.

Construction Equipment and Materials

Light-Weight Aggregate Decision Confirmed on Appeal

In a recent decision the Circuit Court of Appeals for the Seventh Circuit, sitting in Chicago, affirmed the decision of the District Court for the Eastern District of Illinois in the case of Silica Products Co. vs. Haydite Co. and Western Brick Co., holding that the Hayde and Olsen patents for the preparation of light-weight concrete aggregate by burning shale do not apply to the same process. The decision of the district court was reported in *Engineering News-Record*, Oct. 17, 1929, p. 635.

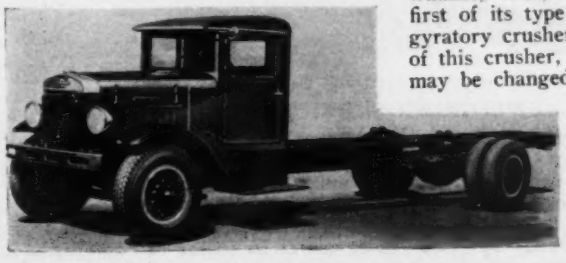
Tractor Breaks Endurance Record

Successfully completing a non-stop test run of 481 hours and 5 minutes, or 1,011 miles, under the direction of the agricultural engineering department of Oregon State College, a Caterpillar 10 tractor, pulling a full load of plow or cultivator whenever weather permitted working the land, broke three former endurance records for light, medium and heavy machines. During the test 724 gal. of gasoline was used, 64 qt. of crankcase oil added, and 37½ qt. drained. Although the engine turned 37,421,098 revolutions, measurements after the test showed cylinder wear of only 0.001 in. Track elongation amounted to 0.6 in.

New Developments

Double Reduction Drive Used in Heavy-Duty Trucks

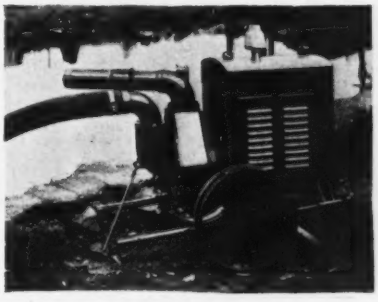
Recent additions to the line of heavy-duty motor trucks produced by the International Harvester Co., Chicago, Ill., include models W-2 and W-3, rated, respectively, at 2½ and 3½ tons. These are of similar construction and each is available in five wheelbases, the smaller from 130 to 200 in. and the larger from 144 to 235 in. Final drive is of the double-reduction type. Engines are of the four-cylinder, valve-in-head type with overhead camshaft and valve mechanism. Each consists of five independently maintained sub-assemblies which greatly simplify servicing. The W-1 engine is 4¼ by 5½, developing 53.5 b.hp. at a governed speed of 1,800 r.p.m. The W-3 motor is larger, 4¼x5½ in., and develops 60 b.hp. at the same speed. Other equipment includes internal expanding four-wheel brakes, shatterproof glass in the rear of the cab, and transmissions with five speeds forward and two in reverse.



HEAVY-DUTY FOUR-CYLINDER MOTOR TRUCK

4-In. Portable Centrifugal Pump

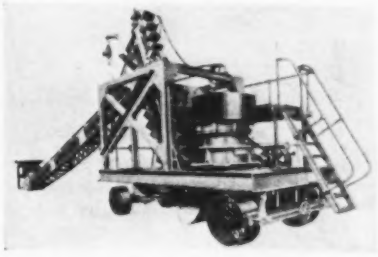
As an addition to its line of portable equipment, the Homelite Corp., Port Chester, N. Y., has announced a 4-in. portable self-priming centrifugal pumping unit with built-in gasoline engine. As in other Homelite units, the pump is self-priming without use of auxiliary pumps or vacuum apparatus. Pump capacity is 25,000 gal. per hour; suction lift is 20 ft. The bronze impeller is of the open type. Powered by a Le Roy 8-10-hp. four-cylinder gasoline engine, the complete unit weighs 730 lb.



SELF-PRIMING CENTRIFUGAL PUMPING UNIT

Portable Rock and Gravel Plant Uses Gyratory Crusher

Two accurately sized products to conform with state or county specifications for gravel or hard surfaced roads are delivered by the new Telsmith portable crushing, screening and loading plant of the Smith Engineering Works, Milwaukee, Wis., which is said to be the first of its type to be equipped with a gyratory crusher. By varying the size of this crusher, the size of the product may be changed or, for quarry operations, a two-crusher plant can be operated by the addition of another unit at the foot of the feed conveyor. The standard plant requires a 45-hp. electric motor or a 60-hp. gasoline engine or tractor. It has six units: a steel receiving hopper; a steel-frame feed conveyor with two-wheel truck; a complete crushing and screening plant, mounted on heavy trucks, with equipment consisting of a double-deck vibrating screen, a gyratory crusher, an elevator, a jib crane and a steel operator's platform; steel conveyors for both fine and coarse products; and a two-compartment, all-steel storage bin for loading trucks. Anti-friction bearings are used throughout the unit, which has a total weight of 53,800 lb. Production varies from 20 to 60 tons per hour, depending upon the finished product wanted.



PORTABLE PLANT WITH GYRATORY CRUSHER

Electrode for Light Welding

For use on 16-, 18-, 20- or 22-gage material in making lap, butt or corner welds, the Lincoln Electric Co., Cleveland, Ohio, is producing a new welding electrode known as Lightweld. This is to be used with a manual carbon arc and from 30 to 60 amp. direct current, and is suitable for horizontal, vertical or overhead work. With this electrode it is claimed that speeds of from 7 to 18 in. per minute can be obtained, depending upon the type of joint and the skill of the operator.

Tachometer of New Design

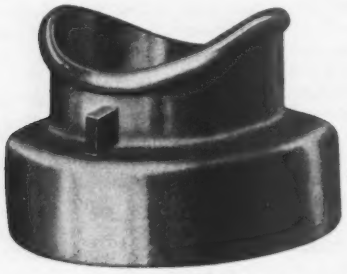
For indicating and recording the speed of revolution of machinery, a new type of tachometer of simple and rugged construction has been brought out by the Amthor Testing Instrument Co., Inc., 309 Johnson St., Brooklyn, N. Y. The principle of operation of this instrument is that of a mercury-filled pendulum which has the form of a U-tube with a flow tube in the center. As the speed increases, the mercury is forced into the leg of the U-tube, the mercury level in the center tube falling in direct proportion to the speed. A float transmits this motion directly to the recorder and

MERCURIAL TACHOMETER

dial. This tachometer is suitable for wide ranges in speed from zero to 4,000 r.p.m. with nearly uniform graduation of the scale. Where such a wide range is not required, the lower part of the graduation can be suppressed, permitting the use of wider subdivisions for the upper working range. The instrument is 40 in. high and utilizes a chart 19 in. long with a recording range 4½ in. high.

Cast-Iron Fitting for Making Branch Sewer Connections

Connecting house services or branch lines with main sewer pipe of concrete or terra cotta is facilitated by the use of the M-D cut-in connection, just placed on the market by the Atlas Mineral Products Co., Mertztown, Pa. This is made for use with sewer pipe of all



CAST-IRON CUT-IN CONNECTION FOR SEWERS

sizes and for house services of either terra cotta or cast iron of the various diameters usually used. In using the connection, a hole of the proper size is cut in the sewer pipe at the required vertical angle, the spigot end of the fitting is inserted, a small amount of jute is packed in the space between the spigot of the fitting and the rim of the hole in the sewer pipe, and a coating of lean concrete or cement mortar is applied around the outside of the fitting and pipe adjacent to the connection. There is a bead on the spigot end of the cut-in fitting which prevents the jute or concrete from entering the sewer pipe, and stops or wings on the side of the fitting to allow the spigot end to enter the sewer pipe only so far as to be flush with the inner surface.

Drive Chains Made of New Metal

Discovery of a new method of processing malleable iron which so alters its physical characteristics as to make a distinctly new metal has resulted in the announcement of Promal by the Link-Belt Co., Chicago, Ill. Drive chains made of this material have, to a high degree, the qualities desirable in sprocket chain material: great toughness to resist extreme tension without permanent stretch; high strength in proportion to weight and size; and hardness that affords great resistance to abrasive wear. Promal also has a yield point 25 per cent higher than that of average malleable iron, and is so tough and ductile that it withstands shock and fatigue loads. Temperatures up to 1,000 deg F. will not cause it to become brittle. Tests conducted by the manufacturers show the following qualities for the new metal, compared with malleable iron and annealed mild cast steel:

	Promal	Malleable Iron	Cast Steel
Yield point (lb. per sq.in.)	45,000	36,000	34,000
Ultimate strength (lb. per sq.in.)	65,000	54,000	60,000
Elongation (per cent)	14	18	26
Brinell hardness	170–190	110–130	120–140

Costs and Contracts

E. N.-R. Index Numbers

Cost			Volume		
July 1, 1930	**200.95**	**June, 1930**	**324**
June 1, 1930	203.36	May, 1930	354
July 1, 1929	204.77	June, 1929	347
Average, 1929	207.02	Average, 1929	317
Average, 1928	206.78	Average, 1928	287
1913	100.00	1913	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of July 24, with some comparisons, total as follows:

(In Thousands of Dollars)

	July 24, 1930	Average, Last Four Weeks 1930	Average, Last Four Weeks 1929
Buildings:			
Industrial	$14,941	$7,992	$7,249
Other	5,244	18,014	30,485
Streets and roads	10,023	14,888	15,869
Other eng. constr.	7,024	12,749	22,921
Total	$37,232	$53,645	$76,526

Total, all classes Jan. 1 to July 24:
1930 ..... $2,065,404
1929 2,546,029

Business Notes

GLAMORGAN PIPE & FOUNDRY CO., Lynchburg, Va., has appointed Frank Grossman a special representative, with headquarters in Chicago, Ill.

INTERNATIONAL FILTER CO., Chicago, Ill., and associated companies have removed their general offices and engineering departments to 59 East Van Buren St.

MARQUETTE CEMENT CO. is planning the erection of a $150,000 addition to its plant at Memphis, Tenn.

SIMPLEX VALVE & METER CO., Philadelphia., Pa., has appointed Goldsborough & Vansant, Inc., Pittsburgh, Pa., its district representative.

CHARLES B. SPICER, resident manager of the St. Louis office of the Hercules Powder Co., Wilmington, Del., has retired after 43 years of continuous service in the explosives business.

PARADON MFG. CO., Arlington, N. J., has appointed Wilmer C. Hanson export manager, with headquarters at 30 Church St., New York City.

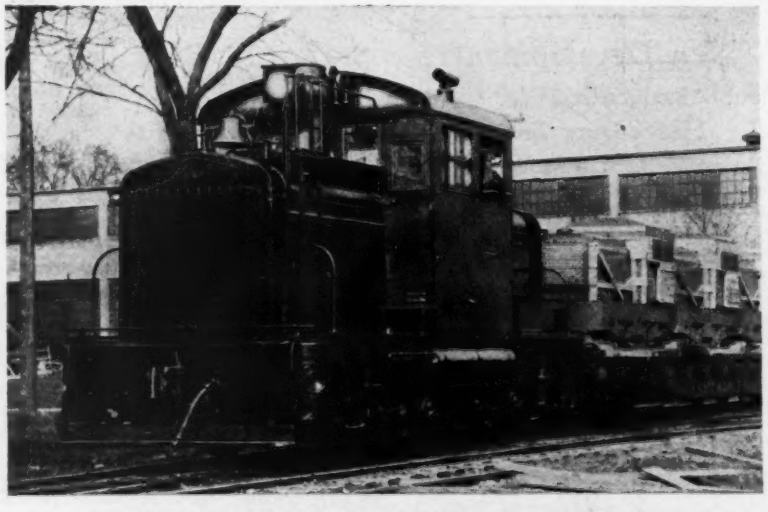
CHASE BRASS & COPPER CO., Waterbury, Conn., has opened a new warehouse in Pittsburgh, Pa.

BECKWITH MACHINERY CO., Pittsburgh, Pa., has awarded a contract for the erection of a new brick and steel building, 204x116 ft. for use as a showroom, warehouse and complete service shop.

AMERICAN TANK & EQUIPMENT CORP., Oklahoma City, Okla., has placed in operation its new factory building of all welded construction.

COATESVILLE BOILER WORKS, Coatesville, Pa., has acquired the Middletown, Pa., plant of the Standard Steel Car Co., comprising approximately 40 acres of land and 500,000 sq.ft. of floor space. The new facilities will be used in lieu of contemplated plant expansions at Coatesville.

UNIVERSAL ATLAS CEMENT CO., Chicago, Ill., has appointed C. A. Webb district sales manager in charge of the Chicago district. He succeeds W. L. Greenly, who has been transferred to the general sales office. Mr. Webb, who has been with the company for thirteen years, is a graduate civil engineer from the University of Arkansas and also has a master's degree in engineering from Columbia University. He is a member of the Western Society of Engineers and an associate member of the American Society of Civil Engineers.



OIL-ELECTRIC LOCOMOTIVE FOR RAILWAY SWITCHING SERVICE

One of the two 80-ton oil-electric locomotives of the rigid wheelbase type recently built by the Geo. D. Whitcomb Co., Rochelle, Ill., for the Chicago, Milwaukee, St. Paul & Pacific Railroad. Driven by two 300-hp. six-cylinder motors supplying current to four 600-volt Westinghouse electric motors, this unit develops a maximum starting tractive force of 40,000 lb., or 48,000 lb. with sanded rail. The locomotive is 29½ ft. long from center to center of couplers and has a rigid wheelbase of 13½ ft.

Unit Prices From Current Construction Bids

Superstructures of Springwells (Detroit) Pumping Plant and Filter Building

FOUNDATIONS for the Springwells pumping station and filter building of the city of Detroit, Mich., are now under construction, and contract was awarded May 9 for the superstructures. W. E. Wood Co., Detroit, has the contract for the substructure for the high lift pumping plant and filter building, including coagulation basins; E. H. Latham Co., Columbus, has the contract for the substructure for the low lift pumping plant, and is constructing piles and base slab foundation for the high lift pumping plant. The remainder of the substructure for the high lift pumping plant, as well as the superstructure for the two buildings, will be built by Bryant & Detwiler Co., Detroit, under the new contract. This superstructure consists of concrete walls for pipe vault, building walls of pumping plant, and concrete suction chambers for sixteen motor-driven centrifugal pumps.

The pumping plant superstructure will house both low lift and high lift plants. The low lift purping plant section contains eight pumps with a rated gross capacity of 435 m.g.d. The high lift pumping plant section will ultimately have sixteen pumps with a rated capacity of 680 m.g.d.

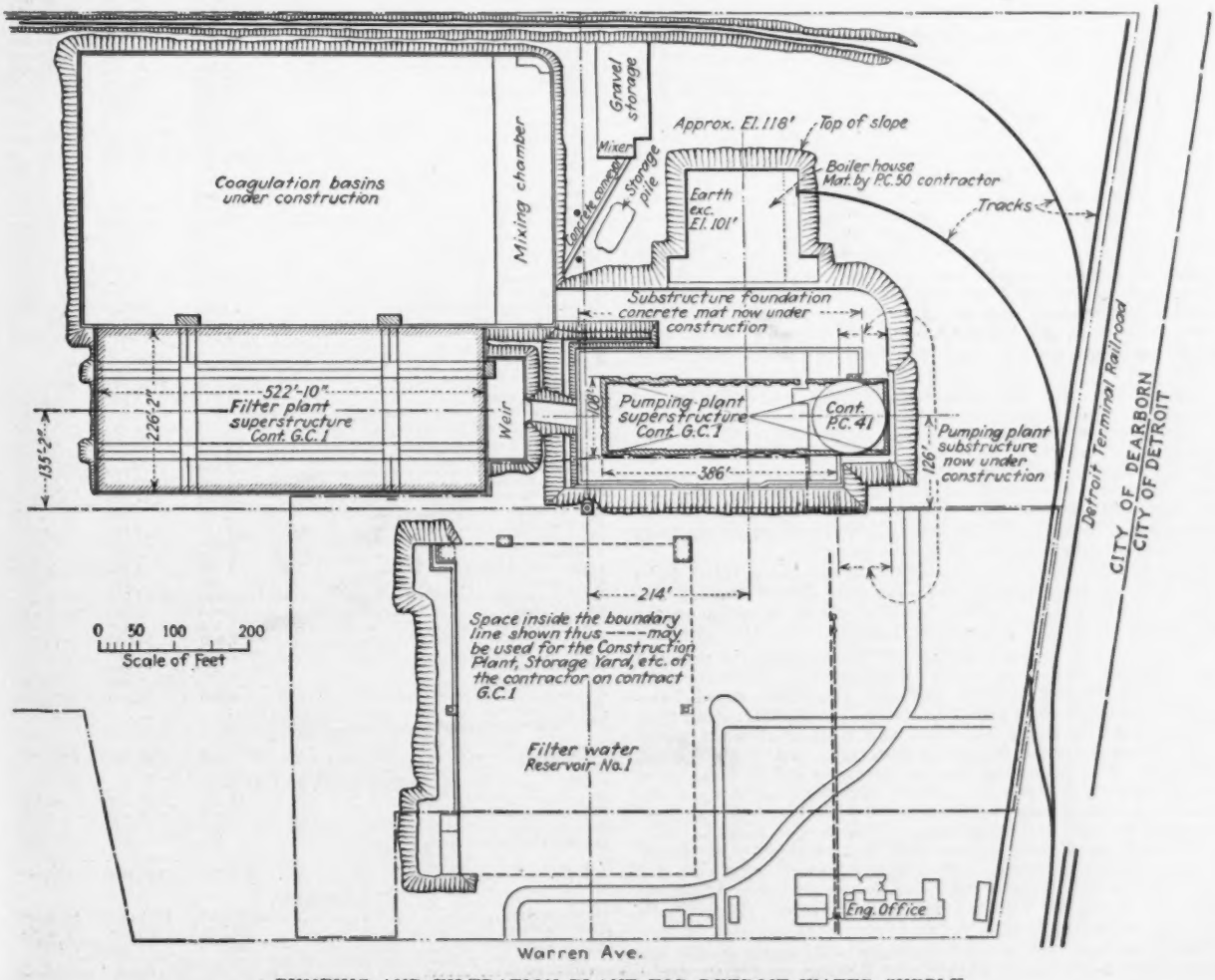
The illustration gives the general arrangement. The pumping plant is 386x108 by 50 ft. high; the filter building 423x226 by 15 ft., with some portions 40 ft. high. Both structures are of brick, tile, stone, terra-cotta and structural-steel construction. The contract price is $1,232,082, comprising $794,049 for the pumping plant, $427,536 for the filter building and $10,497 for the clear water conduits connecting the two buildings. As this is a lump sum contract, the best basis of comparison is the cost of the buildings per cubic foot:

	Pumping Plant Pipe Vault	Filter Building
Bryant & Detwiler Co.	$0 21	$0 241
W. E. Wood Co.	0 214	0 241
Walbridge Aldinger Co.	0 219	0 28
J. W. Butler Construction Co.	0 244	0 241
E. H. Latham Co.	0 244	0 249
A. A. Albrecht Co.	0 276	0 30

These prices do not include electrical, heating, ventilating or plumbing work, which will be handled by other contracts.

Order of Procedure—Concrete work on the pumping plant substructure could begin on the west end June 1, 1930, and the erection of the steelwork on the filter building superstructure on July 1. The first operation on the substructure is to construct the walls of the pipe vaults; the top of the vault to be placed after the steel pipe headers have been installed, the latter operation beginning about Nov. 1. Beginning about Jan. 1, 1931, all of the area surrounding the work will be backfilled and graded under other contracts.

Concrete—Item 1 includes furnishing, storing and handling all concreting materials. Concrete is of four classes: (A) Reinforced concrete in all beams and slabs, in walls less than 12 in. and for incasing steel beams and columns is 1 : 2 : 3 mix using



PUMPING AND FILTRATION PLANT FOR DETROIT WATER SUPPLY

Unit Prices of Detroit Water Supply

Published in *Engineering News-Record*

	Issue
Springwells tunnel, sect. 2, $1, 359,746	Dec. 9, 1926
Springwells tunnel, sect 3, $1,092,471	May 26, 1927
Springwells tunnel, sect. 4, $687,457	June 23, 1927
Pennsylvania Ave. tunnel, contr. LC-6, $779,901	Feb. 9, 1928
Springwells tunnel, contr. LC-5, $572,479	Feb. 14, 1929
Springwells filtered water reservoir No. 1, contr. FC-7, $538,500	May 16, 1929
Foundation for filtration plant, Springwells station, $584,386	June 20, 1929
River tunnel, contr. RC-3, $639,263	June 27, 1929
Substructure for pumping plant, Springwells station, contr. PC-41, $403,969	July 18, 1929
Intake structures and shafts, river connecting tunnel, contr. RC-4, $1,083,600	Nov. 7, 1929
Power plant foundations, Springwells station, contr. PC-50, $588,477	Nov. 7, 1929
Land tunnel and structures of intake system, contr. RC-12, $583,530	May 22, 1930

1-in. gravel. (B) Other reinforced concrete is 1 : 2½ : 4 mix using 2-in. gravel. (C) Plain concrete fill on roofs, back of forms or elsewhere, is 1 : 3 : 5 mix using 1-in. lightweight aggregate. (D) All floor finish required on pumping plant base slab between El. 95 and 98 is 1 : 1 : 2 mix using special aggregate. In the mortar strength test, the fine aggregate must have a compressive and tensile strength at 7 and 28 days of not less than 100 per cent of that developed by the same cement and standard Ottawa sand. The lightweight aggregates are broken tile, terra cotta, gypsum, haydite or slag, but not cinders. The slump for the different classes of concrete, tested at the forms, is 6 to 8 in. for Class A, 4 to 6 in. for Class B, and not more than 1 in. for Classes C and D.

Reinforcing Steel—Item 2 includes wire wrapping (of cold-drawn No. 16 or other fabricated wire beam wrapping) of all structural-steel columns and beams to be incased in concrete. The lower flanges of the beams are caged and the entire circumference of all beams 18 in. or over are completely caged or wrapped.

Equipment Foundations—Item 3 is for foundations of main pumping units, check valves, discharge pipe lines, vacuum pumps, pressure tanks and pressure system pumps, and includes anchor bolts, sleeves, reinforcing steel and wall ties. The front of all high lift pumping plant pump foundations are faced with terra cotta. Anchor bolts are placed in vertical rows 24 in. center to center and each foundation is provided with a cast-iron door for access to power leads under motor.

Brick and Tile Masonry—Item 5 includes brick and tile walls and back-up masonry in the pumping plant, and all back-up masonry, parapets and face brick and salt-glazed brick tile walls within the filter building. All brick and tile work will be erected in conjunction with limestone and terra cotta. The face-brick matches the limestone and has a compressive strength of 3,500 lb. Common brick is Detroit hard-burned. The limestone is standard buff Indiana Oolitic. The interiors of all walls in both buildings above the main floor are faced with terra cotta.

Roofing and Sheet Metal—Item 18 includes roof insulation, tar and gravel roofing, and sheet-metal work. The entire roof area of the filter building, except skylights, and the roof over the pumping-plant elevator penthouse is covered with a pitch and gravel built-up roof over cork insulation, consisting of four layers of coal-tar-saturated rag felt cemented together with coal-tar pitch and surfaced with gravel. The insulation is a 1½-in. layer of cork board laid in hot pitch. The roof on the pumping plant is 16-oz. sheet copper, laid with battens.

Quarry Tile—Item 19 is for 6x6x¾ in. square vitrified dark-red quarry tile for finishing the main floor of the pumping station, including pump pit floors, and all floors in aisles on the main floor at El. 131 in the filter building.

Terrazzo—The finished section of the buildings is provided with terrazzo covered bases, borders and curbs, under item 20, as follows: Main floor of pumping plant has coved bases and borders at all walls and at equipment foundations; main floor of filter building has coved bases and borders at walls where there is quarry tile floor, and coved curbs and borders along all aisles. The supporting slab for terrazzo is left 2 in. below the finished floor elevation. After saturating with water for two hours, a thin coat of cement grout is laid and the concrete for terrazzo poured immediately. This bed, consisting of 1 part cement to 4 parts coarse sand, is leveled off ¾ in. below the finished floor elevation. The terrazzo mixture, consisting of 1 part cement and 2 parts marble chips is applied. Additional chips are sprinkled over the surface and rolled to obtain 90 per cent marble surface.

Painting—Item 21 includes painting and finishing all exterior metal work except copper, and includes steel sash, metal trim and doors. It also includes interior metal work and all exposed structural steel and other metal work except plumbing, heating and piping.

Castings, Pipe, Valves and Sluice Gates—Item 24 includes erection of six 84-in. gate valves with operating stands, two 84-in. flat valves with lifting cable, six 12-in. bypass gate valves, wall castings and intermediate 84-in. pipe, wall castings and intervening 12-in. c.-i. pipe, c.-i. frames and guides for 22 6x6-ft. sluice gate openings, three 6x6-ft. sluice gates, c.-i. pipe and suction bells for suction to main pumping unit in high lift plant, c.-i. discharge piping, including check and gate valves complete from main high lift pumps to flange tees on 72-in. steel pipe header in the vault, two 54-in. gate valves, one 72-in. gate valve, four 16-in. floor castings for wash-water piping. All piping, valves, and fittings will be finished and delivered under other contracts.

Miscellaneous—Item 28 includes maintenance of engineer's field offices, progress photographs, and maintenance of railroad trackage on the site.

Bonds—The performance and the labor and material bonds are for $1,000,000 each.

Bidding—Six bids were received, the second only $11,000 more than the lowest and the spread between low and average 9 per cent. The prices in the tabulation are lump sums for the various operations outlined in the foregoing. The lowest three bidders are: (A) Bryant & Detwiler Co.; (B) W. E. Wood Co.; (C) Walbridge Aldinger Co. The other three contractors are the J. W. Butler Construction Co., E. H. Latham Co. and Albert A. Albrecht Co. George H. Fenkell is general manager and chief engineer of the board of water commissioners.

	A	B	C
PUMPING PLANT			
Concrete	$241,688	$200,000	$234,220
Reinforcing steel	72,523	76,000	64,578
Equipment foundations	10,007	12,000	4,606
Dampproofing of concrete surfaces	858	3,000	2,336
Brick and tile masonry	54,573	57,500	44,983
Stone	65,350	59,200	72,669
Terra cotta	71,450	73,000	74,249
Carpentry	3,500	3,200	8,331
Structural steel	98,000	115,600	100,000
Ornamental metal work	21,000	25,000	24,160
Miscellaneous iron and steel	50,000	48,000	52,200
Steel sash	7,500	10,200	7,567
Rolling steel door	1,200	1,050	1,207
Hollow metal doors	2,000	1,850	1,786
Hardware	400	425	383
Roofing and sheet metal work	30,000	22,500	28,104
Quarry tile	13,000	11,200	13,120
Terrazzo	4,000	4,100	4,286
Painting	4,000	5,600	4,250
Glazing	2,000	1,700	1,895
Drainage system	4,000	3,800	3,845
Metal castings, pipe, valves and sluice gates	10,000	29,850	30,386
Steel pipe headers	5,000	13,200	23,360
Brick paving for pipe vault	8,000	5,800	7,461
Plastered wall partitions	1,500	1,200	1,440
Miscellaneous	500	2,500	1,478
Cleaning up	.....	1,500	1,000
Contract bond, insurance, etc.	12,000	20,000	15,000
Total	$794,049	$801,975	$828,900
FILTER BUILDING			
Concrete	$106,359	$105,440	$110,500
Reinforcing steel	10,277	12,800	10,000
Dampproofing for concrete surfaces	862	1,000	1,000
Brick and tile masonry	32,338	24,300	35,000
Stone	61,205	68,400	89,000
Terra cotta	20,250	15,500	30,000
Carpentry	7,000	2,900	4,200
Structural steel	43,000	52,000	52,000
Ornamental metal work	21,000	19,500	23,000
Miscellaneous iron and steel	9,500	2,100	3,200
Floor gratings	2,145	2,400	3,100
Skylights	32,000	29,000	33,000
Steel sash	10,500	8,300	10,000
Hollow metal doors	3,000	3,450	3,800
Hardware	800	875	900
Roofing and sheet metal work	40,000	37,900	46,000
Quarry tile	8,000	7,800	8,000
Terrazzo	3,400	3,050	3,800
Painting	7,000	10,800	12,500
Glazing	2,000	1,850	2,100
Miscellaneous	500	2,100	2,000
Cleaning up	.....	1,200	1,000
Contract bond, insurance, etc.	6,400	10,000	12,000
Job overhead	.....	.....	.....
Miscellaneous job expense	.....	.....	.....
Total	$427,536	$429,665	$496,100
CLEAR WATER CONDUITS			
Concrete	$7,938	$7,500	$8,300
Reinforcing steel	2,170	2,500	2,500
Miscellaneous	229	100	150
Contract bond, insurance, etc.	160	200	200
Total	$10,497	$10,300	$11,150
SUMMARY			
Pumping plant	$794,049	$801,975	$828,900
Filter building	427,536	429,665	496,100
Clear water conduits	10,497	10,300	11,150
Grand totals	$1,232,082	$1,241,940	$1,336,150
For alternate construction of roof	Deduct $6,500		

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	Project	Cost	Status
Sewers			
Dallas	Sewage Plant	$1,500,000	Proposed
Bridges			
Vancouver (B. C.)	Bridge	2,500,000	Proposed
Pittsburgh	Bridge	2,000,000	Proposed
Sports and Parks			
Del Monte (Calif.)	Golf Course, etc	1,000,000	Proposed
Factories and Mills			
Ambridge, (Pa.)	Mill	2,000,000	Proposed
Terre Haute	Factory	1,000,000	Bids asked
Power Plants			
Indianapolis	Power Plant	12,267,075	Contract
Warehouses			
Chicago	Warehouse	1,000,000	Contract
Buildings			
Oklahoma City	Bank	3,000,000	Proposed
Cincinnati	Bank	2,000,000	Proposed
Chicago	Club	1,500,000	Bids asked
Hartford	Hospitals	1,425,000	Proposed
St. Paul	City Hall, etc.	4,000,000	Proposed
St. Louis	School	3,000,000	Proposed
Syracuse, (N. Y.)	School	1,000,000	Proposed
Nashville	School	1,000,000	Proposed

WATERWORKS

PROPOSED WORK

Calif., Cloverdale—For 15,000 ft. 2 and 4 in. mostly c.i. pipe, 26 fire hydrants, gate valves. $15,000. A. M. Jensen, 68 Post St., San Francisco, engr.

Calif., Fresno — Fresno Co. Water Dist. 1, water distribution system, 39,000 ft. 4- to 8-in. pipe. $50,000. A. Segal, Griffith-McKenzie Bldg., Fresno, engr.

Calif., Paso Robles—Rejected bids furnishing, installing pump. Will probably readvertise.

Conn., Bridgeport—Bridgeport Hydraulic Co., 820 Main St., S. Senior, pres., extending waterworks to Long Hill and Short Beach. $80,000. Private plans.

Conn., New Hartford—R. Eisendrath, Bakerville, water supply, incl. swimming pool. $15,000. Wilcox Eng. Co., 24 East Main St., Torrington, engrs.

Conn., Torrington — Torrington Water Co., 1,000,000,000 gal. reservoir. E. B. Phelps, Columbia University, New York, in charge sanitary details. W. G. Smith, State Bd., Hartford, engr.

Mich., Birmingham — Village, 12 in. main through section east of Derby Well. $15,000. J. W. Parry, village mgr.

Mich., Inkster—Waterworks, incl. 1 mi. 6- to 8-in. c.i. mains, valves, fittings, hydrants, special castings. $20,000. Mason L. Brown & Son, 120 Madison Ave., Detroit, engrs.

O., Cleveland—Comrs., Cuyahoga Co., bids after Aug. 1, 1 mi. 6 in. c.i. mains in Brecksville Rd., Impvt. 453. $30,000. W. J. Rogers, Ulmer Bldg., engr.

Okla., Conserville—Preliminary plans new waterworks. $15,000. W. J. Rogers, mayor, Engineer not selected.

Okla., Valliant — Preliminary plans waterworks extension. $15,000. A. Renner, city clk. Engineer not selected.

Tex., South San Antonio — Extending distributing system, incl. installation fire plugs, pumping unit, in outlying districts. $100,000. J. C. Everett, mayor. Municipal Eng. Co., Inc., Athletic Bldg., Dallas, engrs.

Wis., Fond Du Lac—City, G. Watson, mayor, waterworks, incl. 500,000 gal. water tank, two 3 m.g. centrifugal pumps, and 1,400 g.p.m. deep well pump. Alvord, Burdick & Howson, 20 North Wacker Dr., Chicago, Ill., engrs.

Ont., Galt—P. Utilities Comn., A. B. Scott, secy., 400 to 500 hp. diesel engine auxiliary plant in connection with waterworks. $30,000. C. Cuthill, supt. Water Dpt.

Ont., North Bay — Extending waterworks, incl. c.i. mains, trenching, valves, hydrants. $37,950. W. G. Mackie, city engr.

BIDS ASKED

Ill., Princeton—July 28, by City, rein.-con. settling tanks, reservoir, brick filter building. $20,000. Shields, Jordan & Roe, 205 West Wacker Dr., Chicago, engrs. This corrects report in July 17 issue under "Sewers."

Mich., Grosse Pointe Farms (mail Grosse Point)—July 28 (extended date), 6 m.g.p.d. filtration plant, pumping station, coagulation, office and pump buildings, settling basin and filter building, also filtered water reservoir (separate unit), power transmission lines, piping, connections. Hoad, Decker, Shoecraft & Drury, Ann Arbor, engrs. Noted June 12.

N. J., Mountain Lakes—July 28, by Mayor and Boro Council, Boro Hall, 4,350 lin. ft. mains in Lake Dr., Pollard Rd., Boulevard and Woodland Ave. F. T. Rubidge, boro engr.

N. Y., Brooklyn—July 29, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Sterling Pl., Avenue M, Ralph and Tilden Aves., Joralemon, Navy, 49th, East 84th, and South 4th Sts.

N. Y., Long Island City—July 25, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in 65th Pl., 82nd and 45th Rds., 53rd and 25th Dr., 43rd, 67th, 70th, 76th, 189th and 206th Sts., Seneca, Willoughby, 31st and 44th Aves.

O., Akron—Bd. Control, bids about Sept. 14, 2 m.g., standpipe, on Sherbondy Hill to take care of extra storage from Wooster Avenue Pumping Station. $35,000.

O., Canton—Bd. Control, bids about Sept. 14, extending mains in all sections city. $100,000. W. E. Sarver, City Hall, engr.

O., Columbus—See "Streets and Roads."

Pa., Oil City — July 28, by B. B. Weber, city engr., excavating, backfilling trenches for 3,000 lin.ft. water mains along extension of Senica St. from Allied Barrel Works to McClintockville Bridge approach.

CONTRACTS AWARDED

Ill., Chicago—Bd. Local Impvts., City Hall, water service pipes in West 127, 128th and 129th Places, West 122nd and 128th Sts., Brainard, Parnell, Normal and Eggleston Aves., to Walsh & Metzger, 6828 South Chicago Ave.; Gliddings and Slocum Sts., South Kilbourn, South Tripp, North Melvina, North McVicker, North Meade, North Moody, South Karlov, South Keeler, and North Melvina Aves., to P. J. Collins Co., 5521 Bway.; East 95th, 96th, 97th and 98th Places, East 96th, 97th and 98th Sts., Bennett, Euclid and Chappel Aves., to Reliance Plumbing & Heating Co., 2430 West Van Buren St.; North McVicker, North Meade, North Moody and North Melvina Aves., to Washington Plumbing & Heating Co., 461 North Halstead St.

Ill., Oak Lawn—For 6- to 12-in. c.i. mains, to Henry Reiss & Sons, Quincy, $242,629.

Kan., Brewster — Complete waterworks, to O'Niel Constr. Co., Leavenworth, $17,953. Est. $19,000. Noted Apr. 3.

Kan., Grainfield—New waterworks, incl. 21,821 ft. 2- to 8- in. c. i. mains, 6,305 lb. c. i. specials, 25 valves and boxes, 16 fire hydrants, 50,000 gal. tank on 110 ft. tower, pump house, to O'Neil Constr. Co., Leavenworth, $24,059. Est. $29,000.

La., Oberlin—City, labor and installation, to A. C. Jones, Opelousas, $5,692; deep well, to Ritter Deep Well Wks., Abbeville; 25,000 gal. tank on 100 ft. tower, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill., $3,200. Est. $19,169.

Md., Baltimore — Bd. Awards, mains in Carnegie Ave. and Willow Spring Rd., to Ligon & Ligon, 3310 Ridgewood Ave., $26,818. Noted June 26.

Mass., Amherst—Amherst Water Supply Co., 37 South Pleasant St., 16,000 lin.ft. 8 and 10 in. c.i. pipe, to G. Ferullo, Inc., 31 North St., Boston. Est. $15,000 or ore. Noted June 19.

Mass., Gloucester—Bd. Water Comrs., water towers in connection with Alewife Dam and Reservoir, to Chicago Bridge Co., 37 West Van Buren St., Chicago, Ill. Est. exceeds $15,000. Noted July 10.

Mass., Springfield—Bd. Water Comrs., completing Cobble Mountain Dam, to S. J. Groves & Sons, 306 Globe Bldg., Minneapolis, Minn., $960,000. Original contractor withdrew. Noted July 26, 1928, under "Contracts Awarded."

New York—Bd. Water Supply, 346 Bway., New York, bronze shaft caps, appurtenances for City Tunnel 2, Contr. 236, to American Manganese Bronze Co., Rhawn and Hegerman Sts., Holmesburg, Phila., Pa., $207,063. Noted June 26.

N. Y., Brooklyn—J. J. Dietz, comr., Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Ave. T, to G. V. Cornell Constr. Co., Grand Central Terminal, New York, $10,165.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in 22nd Ave., to Gregory Contg. Co., 351 East 125th St., New York, $7,698. Noted July 3.

N. Y., New York—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., mains in Baychester Ave., to Knidem Constr. Co., 4197 Park Ave., $20,670; Palisade Ave., to Sareno Contg. Co., $29,535. Noted July 3.

N. Y., St. George—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Arlington Ave., to Empire Contg. Co., 6 Church St., New York, $20,600. Noted July 3.

Okla., Holdenville—Fire hydrants, 24,600 ft. 2- to 8-in. c.i. main extensions, to W. E. Roberts, Holdenville, $24,464.

Okla., Hooker—Waterworks and distribution system, to Sherman Machine & Iron Wks., 18 East Main St., Oklahoma City, $45,000. Noted Mar. 27.

Ont., Brantford—Bd. Water Comrs., four 30 in., three 24 in. and one 20 in. sluice gate, to F. Hankin & Co., 2028 Union St., Montreal, $2,024; gate, foot, and check valves, to Jordan-Roberts Sales Ltd., Morell St., Brantford, $6,973; elevated steel tank, to Horton Steel Wks., Bridgeburg, $8,975. Grand total $17,972.

Ont., Ottawa—City, six hundred 5/8- to 6-in. waterworks meters, to National Meter Co. of Canada, 24 Front St. E., Toronto, to Neptune Meter Co. Ltd., 345 Sorauren Ave., Toronto, to Drummond, McCall & Co. Ltd., 160 Wellington St., Montreal, Que., to Gammon Meter Co., Newark, N. J., and to General Supply Co. of Canada, 360 Sparks St. Est. $10,000.

SEWERS

PROPOSED WORK

Calif., Palo Alto—Surveys joint outfall sewer replacing 2 separate outfalls and joint sewage treatment plant. $295,000. Stanford University will pay $74,450 of cost. Burns-McDonnell-Smith Eng. Co., Western Pacific Bldg., Los Angeles, engrs.

Calif., Pasadena—For 4 aeration tanks, $24,000, clarifier $25,000, compressor and power house alterations $26,000, in connection with disposal plant. G. K. Hooper, city engr.

See proposal advertising on page 109

Constr. News page 31

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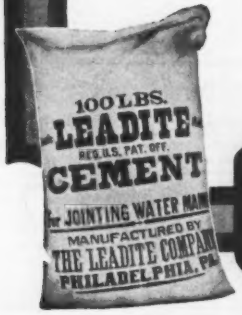

No Caulking

Sewers (Continued)

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., City Hall, storm sewers in West Roxbury. $22,000.

Mass., Braintree—Town Bd. Selectmen, surveys sewerage system. $450,000. Noted Mar. 6.

N. J., New Brunswick — Bd. Comrs., City Hall, preliminary plans storm water sewers in Remsen Ave. from Baldwin to Redmond Sts. $40,000. A. Atkinson, city engr.

Okla., Lawton — City does not plan taking bids sanitary sewers but will take bids about Aug. 14 or Sept. 14, storm sewers, $50,000 voted. This corrects report in June 19 issue. F. E. Lawrence, City Hall, engr.

Okla., Westville—Sanitary sewers, disposal plant, $40,000. Benham Eng. Co., 1106 Perrine Bldg., Oklahoma City, engrs.

Okla., Wewoka — Preliminary plans sewage disposal plant. $30,000. J. Howard, Wewoka, engr.

Tex., Bryan — City, E. J. Jenkens, mayor, rejected bids July 2, sewerage system, disposal plant, incl. altering imhoff tank, new settling basins, sludge collectors, aeration chamber, separate sludge digestion tank. Will readvertise. E. Elrod, Petroleum Bldg., Houston, engr. Noted June 26.

Tex., Dallas—City, c/o E. Goforth, secy., activated sludge type sewage disposal plant. $1,500,000. W. S. Tanner, Dallas, sewage engr. Hawley, Frees & Nichols, 411 Copps Bldg., Fort Worth, engrs.

Wis., Milwaukee—Sewerage Comn., foundations for 70 x 130 ft. dryer house extension, Jones Island. $70,000. R. Cramer, ch. engr.

Ont., Swansea—Village, 8 in. vitr. clay sanitary sewers in Home Smith Subdivision. $53,-138. Wynne-Roberts Son, Metropolitan Bldg., Toronto, archts.

Ont., Toronto—East York Twp., 8 in. vitr. sanitary sewers in earth excavation in Glebemount and Lumsden Aves., Knight and Sproule Sts. $25,000. G. R. Jack, 443 Sammon Ave., engr.

Ont., Hamilton—City Council, 1 mi. 8 in. and up vitr. clay sewers in Forsythe Ave. $29,890. W. L. McFaul, city engr.

BIDS ASKED

Mass., Boston—July 31, by Dpt. P. Wks., J. A. Rourke, comr., City Hall, sewerage works in streets in West Roxbury; Aug. 1, in Hyde Park. $25,000.

Minn., Crosby—July 28, by P. J. Sheets, village clk., 16,193 lin.ft. 8- to 12-in. vitr. clay tile sanitary sewers. $25,000. H. I. Peral, village engr.

Mo., St. Louis—July 29, by Bd. P. Serv., City Hall, 2,150 ft. 36- to 54-in. brick sewer laid in portland cement, for Sect. B-6, Western Mill Creek Public Relief Sewer. $55,600. W. W. Horner, city engr.

N. J., East Orange—July 29, by Essex Co., Park Comn., 115 Clinton Ave., Newark, storm sewer in Oraton Parkway, incl. 13 manholes, 1,159 lin.ft. 12- to 24-in. vitr. and 2,582 lin.ft. 30- to 54-in. rein.-con. pipe, 25 catch basins, $25,000. A. Reynolds, 115 Clifton Ave., Newark, engr.

N. J., East Orange—July 28, by City Council, City Hall, storm drain in Washington Terrace from Park Ave., to Morton Pl. $25,000. E. Willergerod, city engr.

N. Y., Brooklyn—July 30, by H. Hesterberg, pres. Brooklyn Boro. Boro Hall, storm water and sanitary sewers in Avenue X and West 10th St.; storm water sewers in Avenue W, Ocean Parkway, Avenue V, Coney Island Ave., East 7th, East 8th, East 9th Sts.

N. Y., New York—July 29, by W. J. Flynn, acting pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Jennings St., DeWitt and Minford Pls., Bouck and Wilder Aves.

N. Y., Rome—Aug. 6, at office Dpt. Mental Hygiene, State Office Bldg., Albany, sewage disposal plant, at Rome State School. F. W. Parsons, comr.; adv. E. N.-R. July 24.

O., Columbus—See "Streets and Roads."

Okla., Lawton—See "Proposed Work."

Pa., Glassport—See "Streets and Roads."

Wis., Fox Point—July 29, by Village Clerk, storm sewer outfall Bridge Lane to Lake Michigan and Spring Rd. to Lake Michigan and Lake Blvd., incl. 1,428 lin.ft. 54 in. reinforced storm sewers, 201 lin.ft. 12 and 15 in. cement concrete, 52 lin.ft. 21 and 36 in. rein. concrete sewers, 4 special manholes, 10 special inlets, C, 1 special inlet B and 1 special inlet A, 54 in. outlet structure, 36 x 54 in. junction chamber, 1 drop structure, Contr. 6; 1,061 ft. 24 in. special rein.-con. storm sewer, 631 ft. 24 in. special rein.-con. storm sewers in concrete cradle, 345 ft. 12 and 30 in. rein.-con. storm sewers, 4 manholes, 5 No. 2, 3 No. 3 special manholes, 5 special inlets, C, and 24 in. outfall structure, Contr. 7. C. S. Whitney, 214 Mason St., Milwaukee, engr.

Wis., Milwaukee—Aug. 1, by Sewerage Comn., concrete, pile foundation for dryer house addition, Jones Island. $70,000. R. Cramer, ch. engr. Noted July 17.

CONTRACTS AWARDED

Calif., Long Beach — City rein.-con. storm drain, pumping plant in Storm Drain Pump Dist. 2, to Dalmatin & Nickcevich, 841 West 62nd St., Los Angeles, $248,980.

Calif., Martinez—Vitr. and rein.-con. sewers in Monterey St., Impvt. Dist. 5, to M. J. Bevenda, Savings & Loan Bldg., Stockton, $141,-079. Noted July 2.

Conn., New Canaan — Extending Fairfield Street Sewerage Treatment Works, to Merritt, Chapman & Scott, Inc., 17 Battery Pl., New York. Est. $71,000.

Ill., Alton—Turner Tract Sewer Impvt., incl. 14,923 ft. 6- to 36-in. sewers, to J. T. Dennison, Alton, $31,910.

Ill., Chicago—Bd. Local Impvts., City Hall, tile sewers, brick manholes, catchbasins in Lincoln and South Nordica Aves., to O. Scully Co., 7658 Laflin St.; South Nagle, South Mulligan, South Mobile, South Merrimac, South Melvina, South Moody, South Meade, South McVicker, South Narragansett, South Austin and Archer Aves., to G. Barry, 5924 South Wabash Ave.; drains in Lincoln Ave., to A. Santucci, 619 South Ashland Ave.; Wallace, West 97th and 99th Sts., Emerald, Lowe, Parnell and North Western Aves., to Marco Di Vito, 5217 South Kostner Ave.; North and South Western Aves., to P. Scalzitti, 2424 North Tripp Ave.; North Mulligan and Balmoral Aves., to N. Ranieri.

Ill., Chicago—Bd. Local Impvts., City Hall, brick and tile sewers, brick manholes, catch basins in West 55th St., South Mason, South Mayfield, South Mansfield, South Menard, South Massasoit, South Parkside and South Archer Sts., to E. Till, 5475 Hirsch St.; South Luna, South Linder, South Lotus and South Archer Aves., to D. Cuzzone, 922 South Marshfield Ave.

Ia., Iowa City—See "Streets and Roads, under Bids Asked."

Md., Baltimore—Bd. Awards, sanitary sewerage system, disposal treatment works at Fort Smallwood, Anne Arundel Co., to De Cou & Childlaw, 857 North Eutaw St., $14,460; storm sewers in Storm Water Contr. 150, to D. C. McAleer, Lexington Bldg., $30,513. Noted June 26.

Mass., Boston—Sewerage works in Cranston Rd., West Roxbury, to A. D. Daddario, 15 Agnes Ave., Mattapan, $38,945.

Mass., Lodlow—Sewers, appurtenances, to C. Squartigila & Son, 173 Sherman Ave., Waterbury, Conn., $43,142.

Minn., Princeton—C. A. Smith, village clk., 7,000 lin.ft. 8- to 12-in. vitr. tile sanitary sewers, to C. Savonell, Sioux City, Ia.; one section Imhoff tank, to T. Jenson, St. Cloud; installing 4,000 lin.ft. water main extensions, hydrants, to Lametti & Mariana, 537 East Minnehaha St., St. Paul. Est. $25,000. Noted June 12.

Miss., Oxford—See "Power Plants."

Mo., Marshall—C. D. Alexander, city clk., 24,731 ft. 8- to 12-in. vitr. concrete sewers in Dist. 14, to O'Neil Constr. Co., Leavenworth, Kan., $46,496.

N. J., Hillsdale — Dpt. Institutions & Agencies, State Office Bldg., installing mechanical equipment and piping for sewage disposal plant, to A. Williamson, Audubon, $17,385.

N. J., Lodi—Bd. Boro Council, Boro Hall, 30 in. c.i. trunk sewer in South Main St. southerly into Lodi Rd. and Main St., Wallington connecting Passaic Valley Sewer at pumping station, to J. Dominguez, 48 East Pl., $177,363.

N. Y., Buffalo — G. Fisk, comr. P. Wks., Municipal Bldg., Cornelius Creek Drain, to F. G. Hanssell, Ellicot Sq., $152,907. Noted Jan. 2.

O., Brooklyn (br. Cleveland) — Village, sanitary sewers, connections in 5 streets, to Kassouff Constr. Co., 3182 West 25th St., Cleveland, $32,844 and $9,529 respectively.

O., Cleveland—City, Cuyahoga Valley Main Sewer, incl. 2,537 ft. 7 in. circular E brick pipe and 2,547 ft. 6 in. underdrain, to Amato Constr. Co., 3610 East 161st St., Cleveland, $101,228.

O., Elyria—For 16,000 ft. 60 in. and smaller lateral storm sewers, to Cogito Constr. Co., 12616 Corlett St., Cleveland, $75,000.

O., Fairview (br. Cleveland)—Sewers and watermains in Henry Rd., to Rothfus & Zullo, Breckaville, $14,315 and $7,440 respectively; Orchard Rd., to Essi & Hadded, 2196 West 100th St., Cleveland, $7,482 and $5,047 respectively. Grand total $34,284.

O., Shaker Heights (br. Cleveland)—Village, 1,200 ft. 6 x 10 ft. and 8 x 10 ft. concrete culverts in Kingsbury Run, to Curro & Whittaker, Engineers Bldg., Cleveland, $31,927.

Okla., Holdenville—City Clerk, 7 blocks 56 in. storm sewers in Gulf St., to H. L. Cannady & Co., 1122 South Lewis St., Tulsa, $16,052 est. $25,000; sanitary lateral sewer extensions in Penn West, McFarlin Boxley and Diamond Country Club Additions, to W. E. Roberts, Holdenville, $25,324 est. $30,000. Noted June 26.

Okla., Prague — Sanitary lateral sewers in Bway., Tallant and 2nd Sts., to F. L. Brown, Guthrie, $17,990. Est. $25,000. Noted June 26.

Okla., Tulsa—Storm Sewer Project 9-D-30, to Fike & Frye, Inc., 2531 East Independence St., $25,690.

R. I., Providence — Storm sewers in Allens Ave. and right-of-way, to A. Aiello, 60 Weybosset St., $21,153. Est. $25,000.

R. I., Providence—Sewerage works in Mt. Pleasant Ave., to D'Uva & Bafile, 455 Union Ave. Est. $25,000. Noted May 22.

Tex., Beaumont—City, c/o R. Edmonds, 1,800 ft. 48 in. and 700 ft. 42 in. concrete sewers, to Scott Shambough, 1401 Dowling St., Houston, $23,120. Est. $26,000. Noted June 26.

Tex., Columbus—City, O. A. Zumwalt, mayor, sewer collecting system, disposal plant, to Kirkwood, Wharton & Lee, 523 North Flores St., San Antonio, $30,628. Est. $70,000.

Va., Charlottesville — Two sewage disposal plants, to P. N. Howard, Greensboro, N. C., $65,700. Noted June 12.

Wis., Racine — Sewage pumping station, to Bongard Constr. Co., Racine, $51,886; pumps, to Fairbanks-Morse Co., 128 West Water St., Milwaukee, $9,989. Noted June 19.

Ont., Sudbury—For 5,535 ft. 10- to 18-in. vitr. clay sanitary sewers in La Forest Ave., and King St., to R. H. McGregor Constr. Co., 79 Adelaide St. E., Toronto, $32,390. Est. $35,000.

WASTE DISPOSAL

CONTRACTS AWARDED

Wis., Milwaukee—Dpt. P. Wks., City Hall, excavation, cement, piling masonry for incinerator, to Bentley Bros., Inc., 808 South Pierce St., $58,446; cut stone, to Erdmann Cut Stone Co., 41st St. and Custer Ave., $1,758; structural steel, to C. Hennecke Co., 1353 North Pierce St., $19,800; sheet metal copper, to Midwest Ventilating Wks., 249 Pittsburg Ave., $2,748; plumbing, to O. A. Washkow, 2218 State St., $5,987; refrigeration, to J. W. Kock Refrigeration Co., 5021 33rd St., $720; heating, to W. A. Bowers Heating Co., 251 Pittsburg Ave., $480. Grand total $89,939. Noted July 3.

BRIDGES

PROPOSED WORK

California—District to be formed, incl. Marin, Sonoma, Mendocino and San Francisco Counties, bridge over Russian River at Jenner-Road Improvement Dist., Sonoma Co. $195,000.

Calif., San Francisco — City and San Francisco Co. 140 ft. span single leaf drawbridge, 103 ft. clearance, 6 lanes for vehicular traffic, two 6 ft. walks, two street car tracks and track for Belt Line Railroad. California State Harbor Co. will pay $150,000 of cost. M. M. O'Shaughnessy, city engr.

Ind., Gary—Elgin, Joliet & Eastern Ry. Co., Joliet, Ill., A. Montzheimer, ch. engr., bridge over Calumet River, $44,000.

Kan., Leavenworth—Atchison, Topeka & Santa Fe R.R. Co., 80 East Jackson Blvd., Chicago, Ill., G. W. Harris, ch. engr., and Chicago, Burlington & Quincy R.R. Co., 547 West Jackson Blvd., Chicago, Ill., A. W. Newton, ch. engr., rein.-con. viaduct, Pennsylvania Ave. $35,000.

Mich., Detroit—Wayne Co. Road Comn., Barlum Bldg., rein.-con. T-beam bridge, with two 40 ft. spans, concrete sidewalks over Rouge River, Inkster Rd. $40,000. L. R. C. Smith, Barlum Bldg., engr. mgr.

Mo., Webster Groves—Missouri Pacific R.R., E. A. Hadley, ch. engr., Missouri Pacific Bldg., St. Louis, St. Louis Co. (Clayton) and St. Louis P. Serv. Co., soon take bids rein.-con., steel bridge to carry Missouri Pacific R.R. over Lockwood Ave. $80,000.

N. J., Toms River—Bd. Freeholders Ocean Co., 2,000 ft. creosoted timber bridge over Barnegat Bay at Mantoloking. $250,000. H. C. Shinn, Lakewood, engr.

Okla., Sugden — State Hy. Dpt., Oklahoma City, preliminary plans 9 span 118 ft. rein.-con. bridge, Jefferson Co. $27,000. A. R. Losh, hy. engr.

Okla., Temple — State Hy. Dpt., Oklahoma City, preliminary plans 6 span 104 ft., rein.-con. bridge, near here, Cotton Co. $25,000. A. R. Losh, Oklahoma City, hy. engr.

Pa., Pittsburgh—Allegheny Co. bridge from South 10th and Carson Sts. to Armstrong Tunnels and 2nd Ave. $2,000,000—bridge across Youghiogheny River between Boston Village and Versailles Boro., Elizabeth Twp. $900,000—bridge across Flaugherty Run, connecting Flaugherty Run Rd. to Stoops Ferry and Shousetown, Moon Twp. $57,000. V. R. Covell, 519 Smithfield St., engr.

Tex., San Antonio—City, c/o C. M. Chambers, mayor, 2 span 110 ft. rein.-con., steel vehicular and pedestrian bridge over Martinez Creek. $35,000. J. Beretta, c/o Natl. Bank of Commerce Bldg., engr.

Wash., Acme—Whatcom Co. (Bellingham), steel bridge, near here. $35,000.

B. C., Vancouver—Bids in August, Burrard Bridge to form alternative viaduct over False Creek. $2,500,000. J. R. Grant, 500 Beatty St., engr. Noted Mar. 27.

Ont., Ottawa—Secretary Bd. Control, steel bridge, concrete abutments, wing walls over Fairmont Ave. $40,000. A. J. Macallum, City Hall, engr.

BIDS ASKED

Ala., Epes—Aug. 11, by State Hy. Comn., Montgomery, 300 ft. concrete bridge over Alabama Great Southern Ry., 30 ft., near here, Sumpter Co.

California—See "Streets and Roads."

California—Aug. 6, by State Hy. Comn., Sacramento, three 8 ft. slab span bridge, two 14 ft. slab span bridge, and partially reconstructing, asphaltic concrete widening 15 ft. slab span all concrete east of Ontario, San Bernardino Co. C. H. Purcell, hy. engr.

Calif., Zaca—July 30, by State Hy. Comn., Sacramento, rein.-con. girder bridge consisting four 42 ft. 6 in. spans on concrete bents, abutments, over Nojoqui Creek, south here, Santa Barbara Co. C. H. Purcell, hy. engr.

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Bridges (Continued)

Illinois—Aug. 6, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, one 16 ft., one 30 ft. concrete bridges, Route 69, Sect. 123-B, La Salle Co.—1 rein.-con. slab bridge, 1 rein.-con. girder bridge, rein.-con. substructure, 4 rein.-con. girder approach spans, 2 rein.-con. culverts, Route 104, Sect. 143-B—125 ft. steel superstructure, Route 104, Sect. 143-C, both Christian Co.—steel I-beam bridge, four 48 ft. span rein.-con. substructures, sixteen 48 ft. I-beam approach spans, Route 128, Sect. 102-B, Shelby, Fayette and Effingham Counties—50 ft. steel superstructure, Route 128, Sect. 102-C, Shelby Co.—3 rein.-con. girder and 1 rein.-con. slab bridge, Route 128, Sect. 103-B, Fayette and Effingham Counties—10 rein.-con. culverts, Route 78, Sect. 136-B, Fulton Co. F. T. Sheets, ch. hy. engr.

Ind., Albion—Aug. 5, by Bd. Comrs. Noble Co., Bridge 26 in Washington Twp. $26,120. B. H. Burnsworth, Albion, engr.

Ind., Hartford City—Aug. 4, by Bd. Comrs. Blackford Co., 3 bridges. $31,000. L. Speidel, Hartford City, aud.

Ind., Jeffersonville—July 28, by Bd. Comrs. Clark Co., 2 bridges. $28,400. O. B. Fifer, Jeffersonville, aud.

Ind., Plymouth—Aug. 4, by Marshall Co., 3 bridges. $32,300. O. H. Weber, Plymouth, aud.

Ia., Mt. Pleasant—Aug. 1, at office Auditor Henry Co., two 80 x 18 ft. pony truss bridges, one with concrete floor and abutments, other with wood floor and abutments.

Maryland — July 29, by State Roads Comn., Baltimore, single leaf bascule span superstructure overhead counterweight type bridge at Kent Island Narrows on Queenstown-Love Point Rd., Contr. Q-63-28, Queen Anne Co. H. Williar, Jr., Federal Reserve Bank Bldg., Baltimore, engr.

Maryland—July 29, by State Roads Comn., Baltimore, steel, concrete bridge in Prince George Co.; improving bridge over South River in Anne Arundel Co. G. C. Uhl, chn.; adv. E. N.-R. July 24.

Mass., Boston—July 30, by City Dpt. P. Wks., J. A. Rourke, comr., City Hall, reconstructing concrete, steel bridge over Reserved Channel. $100,000.

Michigan—July 29, by G. H. Greene, resident engr., Alpena, F. A. Br. 1 of 6-3-7 Contrs. 1 and 2, Arenac Co., two 60 ft. steel deck girder spans, semi-gravity type abutments, for State Hy. Comn., Lansing.

Michigan—July 30, by R. A. Beers, resident engr., 309 McNair Bldg., Kalamazoo, M. Br. 1 of 78-1-25 Contrs. 1 and 2, St. Joseph Co., 60 ft. steel deck girder span with semi-gravity type abutments; Trunk Line Grade Separation 1 of 11-13-9 Contrs. 1 and 2, Berrien Co., 160 ft. rein.-con., 4 rein.-con. piers, for State Hy. Comn., Lansing.

Missouri—Aug. 1, by State Hy. Bd., Jefferson City, bridges in Clark, Jackson, Knox, Rails and Worth Counties. To exceed $125,000. L. H. Cutler, ch. engr.

N. J., Newark — Aug. 5, by North Jersey Dist. Water Supply Comn., 24 Commerce St., one 30 ft. steel girder bridge over swamp area, one 70 ft. steel truss bridge over Wanaque River, and one 110 ft. steel suspension bridge over Pequannock River, for Wanaque Aqueduct. Fuller & McClintock, engrs., Wanaque Aqueduct.

Okla., Canton—July 28, by J. Stains, clk. Blaine Co., 2 span 100 ft. steel truss bridge on concrete piers, $30,000. W. E. Simmons Watonga, engr.

Okla., Greenfield—July 28, by J. Stains, clk. Blane Co., 1 span 80 ft. steel truss bridge on concrete piers. $25,000. W. E. Simmons, Watonga, engr.

South Dakota—July 29, by State Hy. Comn., Pierre, ten 150 ft. rivited steel spans on concrete piers, abutments, on F.A.P. 233-C, Haakon and Ziebach Counties. M. A. Kennedy, secy.

Tennessee—See "Streets and Roads."

Texas — July 31, by G. Gilchrist, state hy. engr., Austin, rein.-con. bridges on Hy. 38, F.A.P. 598-A, Galveston Co., $44,000, C. O. Washington, Galveston, resident engr.; on Hy. 2, F.A.P. 614-A, McLennon Co., $60,000, H. C. Porter, Provident Bldg., Waco, resident, engr.

Ontario—July 30, by R. M. Smith, deputy minister Dpt. P. Hys., Parliament Bldgs., Toronto, Paris Bridge, concrete, steel, Contr. 30-75, $150,000; overhead crossing over Michigan Central Ry., Waterford, Contr. 30-76, $200,000.

CONTRACTS AWARDED

California—State Hy. Comn., Sacramento, 3 rein.-con. girder bridges over Bear Creek 28 mi. west of Williams, Colusa Co., to R. B. McKenzie, Gerber, $19,966; rein.-con. bridge over Shasta River, 7.5 mi. north of Yreka, Siskiyou Co., to Rocco & Coletti, San Rafael, $97,884. Noted June 12.

California — State Hy. Comn., Sacramento, rein.-con. bridge over Klamath River, 10 mi. north of Yreka, Siskiyou Co., to Rocca & Colletti, San Rafael, $57,779. Noted June 17.

Ia., Atlantic—Cass Co. high truss bridge, to Jensen Constr. Co., Kimballton, $9,544; 11 culverts, to F. O. Akin, Corning, $14,300.

La., Bastrop—Morehouse Parish, c/o Police Jury, bridges over Bayou Bartholomew, Cory and Knox Bridges, to J. W. McKeithen, Grayson, $15,500 and $14,500 respectively; Bonners Ferry and Parker Ferry Bridges, to J. A. Hanchey, Mittie, $14,700 and $16,000 respectively. Grand total $60,700. Cresoted material, to Gulf States Creosote Co., Hattiesburg, Miss.

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Maryland — State Roads Comn., Baltimore, steel bridge over Monocacy River at Frederick Junction, Frederick Co., to American Bridge Co., Continental Bldg., Baltimore, $51,000.

Michigan — At Office R. A. Beers, resident engr., Kalamazoo, MB1 of 78-11-1 C-31 St. Joseph Co., two 50 ft. steel deck girder spans, to Galien Concrete Tile Co., Galien, for State Hy. Comn., Lansing. $23,601 incl. cement. Noted June 12.

Mich., St. Joseph—Berrien Co. Rd. Comn., two 45 ft., four 75 ft. steel deck girder spans, State Reward Br. 1 of 11-4-24 Contr. 1, to McClintock Marshall Co., 8600 St. Aubin St., Detroit, $20,550; two 45 ft., four 75 ft. steel deck girder spans, 2 rein.-con. abutments, State Reward Br. 1 of 11-4-24, Contr. 2, to H. E. Culbertson, State and 1st Ecorse Sts., Detroit, $74,348.

Miss., Senatobia—Bd. Supervs. Tate Co., two 80 ft. span concrete, steel truss bridges over Arkabutla Canal, to J. N. Fewell, Savage. Noted July 3.

Mo., Kansas City—Kansas City Terminal Ry. Co., excavation, footings for bridge over Oak St., to J. W. McMurry Constr. Co., 511 Railway Exch. Bldg., $90,000. Total est. $350,000.

New Hampshire—State Hy. Dpt., Concord, 44 ft. span, rein.-con. arch bridge, Lincoln, and 50 ft. span rein.-con. slab bridge, Crawford, to Caughy & Pratt, Antrim, $6,574 and $9,433 respectively—53 ft. span girder plate bridge, Franconia, to C. D. Marsh Constr. Co., Woodsville, $10,088. Grand total $26,095. Noted June 19.

New York—A. W. Brandt, comr. Hys., Albany, bridges in Monroe Co., to Bender & Dodds, Rochester, $104,927, est. $149,366—Tioga Co., to Paladino-Natanson Co., Inc., 5901 13th Ave., Brooklyn, $131,196 est. $179,636. Noted June 19 under "Streets and Roads."

O., Canton—Stark Co., rein.-con. bridge, Bolivar Rd., to replace one recently damaged by water, to J. Brand, Canton, $34,000. Est. $35,000.

Pa., Smethport—Bd. Comrs. McKean Co., 1 span 154 ft. thru truss bridge, 24 ft. roadway, one 5 ft. sidewalk, rein.-con. abutments, to Deckham Co., Buffalo, N. Y., $39,500.

Texas—G. Gilchrist, state hy. engr., Austin, steel, concrete bridge on Hy. 48, S. P. 575 B and C, Cass Co., to E. Pettus, Montgomery, Ala., $29,061. Est. $54,000.

Tex., Presidio—Atchison, Topeka & Santa Fe Ry. Co., G. W. Harris, ch. engr., Chicago, Ill., 1,900 ft. untreated timber bridge over Rio Grande River, to List Constr. Co., 415 Ry. Exch. Bldg., Kansas City, Mo., $130,000.

Wis., Superior—Douglas Co., bridge, gravel surfacing 5.76 mi. Ashland-Junction-Ashland-Washburn Rd., Federal Project 375-C and D and State Project 8344, to V. Nelson, 2181 East 8th St., $35,955.

B. C., Port Coquitlan — Provincial Government, Dpt. P. Wks., Victoria, heavy timber protection work for bridge over Pitt River, near here, to Fraser River Pile Driving Co., New Westminster.

STREETS AND ROADS

BIDS ASKED

Alabama — July 30, by State Hy. Comn., Montgomery, grading, surfacing 3.64 mi. Heflin-Oxford Hy., 18 ft., Cleburne Co.

Alabama—Aug. 10, by State Hy. Comn., Montgomery, clearing, grubbing, grading 23.5 mi. Moffatt Rd., 28 ft., Mobile Co. $484,698.

Ala., Birmingham—Aug. 18, by City Comn., 7 in. concrete paving 1 block 36th Ave. N. 30 ft. $6,100—2 in. asphalt on 6 in. concrete paving 3 blocks 14th St., S., 40 ft., $17,750—5.5 blocks 1st Ave. N., 70 ft. $46,000.

Ark., Pine Bluff—Bids about July 30, grading, curbing, concrete paving Street Impvt. Dist. 106, East Harding St. $49,000. E. Hale, Natl. Bank Bldg., engr.

California—July 30, at office C. H. Purcell, state hy. engr. Sacramento, grading 0.4 mi. Westerly Boundary-Burnt Branch Rd., Trinity Co.—grading, concrete surfacing 1.7 mi. through Lincoln, Placer Co.—grading, timber bridges, untreated crushed gravel or stone surfacing 2 mi. McDonald-Wendling Rd., Mendocino Co.—grading, oil treated crushed gravel or stone surfacing 9.5 mi. Dunn-Cronise Valley Rd., San Bernardino Co.—16.2 mi. Desert Center-Hopkins Well Rd., Riverside Co.—four 42½ ft. span rein.-con. bridge across Nojoqui Creek, south of Zaca, Santa Barbara Co.

California—Aug. 6, by State Hy. Comn., Sacramento, grading 12.9 mi. Sonora Junction-Coleville Rd., Mono Co.—widening, bituminous treated rock borders 4.3 mi. Santa Clara River-Castaci School Rd., Los Angeles Co.—concrete paving 5.4 mi. Balboa Avenue-Torrey Pines Rd., San Diego Co. C. H. Purcell, P. Wks. Bldg., hy. comr.

Calif., Bell—Aug. 4, by City Trustees, curbing, walks, sewers, oil macadam surfacing Loma Vista Ave. $40,000.

Calif., Gilroy—City Council taking bids curbing, guttering, walks, 6 in. asphaltic concrete paving 260,000 sq.ft. 1st, Hanna et al. streets. R. W. Fisher, 74 North 1st St., Gilroy, engr.

Calif., Los Angeles — July 30, by Bd. P. Wks., City Hall, grading, sanitary and storm sewers, waterworks, 8 in. asphaltic concrete paving 220,000 sq.ft. Olive St. and 23rd Street Impvt. Dist. To exceed $100,000.

Calif., San Bruno—City Council bids about July 30, curbing, guttering, walks, grading, asphalt paving streets in 5th addition. To exceed $30,000. G. A. Kneese, Courthouse, Redwood City, engr.

Calif., San Francisco — July 30, by S. J. Hester, secy. Bd. P. Wks., City Hall, improving Ulloa St., incl. 7,599 cu.yd. excav., 16,261 cu.yd. embankment, 2 in. asphaltic concrete on 6 in. concrete paving. $25,000.

Calif., San Gabriel—City Trustees taking bids curbing, 20,000 sq.ft. sidewalks, 4 in. Durite paving 90,000 sq.ft. Scott Blvd., Gladys St., et al.

Calif., San Mateo—City Council taking bids grading, curbing, guttering, 5 in. asphalt on 3 in. rock cushion paving 134,600 sq.yd. 23rd, 24th Aves., et al.

Illinois—Aug. 6, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, surfacing 0.3 mi. Route 29, Sect. V-X Bureau Co.—0.16 mi. Route 49, Sect. 141-X Kankakee Co.—5.31 mi. Route 69, Sect. 123 La Salle Co.—7.13 mi. Route 78, Sect. 143 Mason Co.—4.5 mi. Route 83 Sect. 128 Mercer Co.—3.58 mi. Route 83 Sect. 129 Mercer and Henry Counties—7.43 mi. Route 84, Sect. 102 Rock Island Co.—6.03 mi. Route 104, Sect. 143 Christian Co.—5.23 mi. Route 105, Sect. 104 and 5.01 mi. Sect. 105 Adams Co.—2.82 mi. Route 111, Sect. 125 Macoupin Co.—0.27 mi. Route 140, Sect. 109-X White Co.—5.94 mi. Route 140, Sect. 110 White and Gallatin Counties—6.61 mi. Route 140 Sect. 111 Gallatin Co.—grading 2.15 mi. Route 104, Sect. 143-A Christian Co.—7.42 mi. Shelby-Lafayette and Effingham Counties—6.96 mi. Route 128, Sect. 103-A Fayette and Effingham Counties—0.33 mi. Route 142, Sect. 106-V-A Marion Co. F. T. Sheets, ch. hy. engr.

Ill., Chicago—July 29, by Bd. Comrs. Cook Co., County Bldg., rein.-con. paving 1.6 mi. 95th St. from Cottage Grove Ave. to Yates St., 40 ft., $80,000—0.05 mi. Ashland Ave. from 115th to 119th Sts., 20 ft., $25,000—0.02 mi. Kedzie Ave., from Granville to Devon Aves. and 1 mi. from Rockford to Western Aves. 20 ft., $10,000 and $50,000 respectively—0.05 mi. Gunnison Ave. from Nagle to Mason Aves. and 0.06 mi. from Harlem to Nagle Aves., 20 ft., $25,000 and $30,000 respectively—1.7 mi. Cicero Ave. from Easton to Devon Aves. and 1 mi. from 22nd St. and Roosevelt Rd., 20 ft., $85,000 and $50,000 respectively—1 mi. 26th St. from 1st to Des Plaines Aves., 40 ft. $50,000—0.05 mi. Harlem Ave. from Central to Chicago Aves., 10 ft. $12,500—0.7 mi. Oakton St. from point 2,000 ft. East of Rand Rd. to Rand Rd. and 1.9 mi. from Rd. to Milwaukee Ave., 20 ft., $35,000 and $95,000 respectively—0.03 mi. Dixie Hy. from Holbrook to Flossmore Aves., 40 ft., and 0.03 mi. from railroad to 183rd St., 22 ft., $40,000 and $15,600 respectively—1.1 mi. Busse Hy. from Miner to Lundergan Aves., 20 ft., $55,000—1.1 mi. Southwest Hy., 20 ft., $55,000. D. B. Quinlan, 139 North Clark St., engr.

Illinois—Aug. 6, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, concrete, bituminous filled brick on concrete, or bituminous concrete (fine or coarse aggregated type) on concrete surfacing 0.57 mi. Route 4, Sect. 6-X-X Grundy Co.—3.09 mi. Route 46, Sect. 91-Y—1.64 mi. Route 46, Sect. 463-Y—1.71 mi. Route 46, Sect. 464-Y—1.1 mi. Route 51, Sect. 102-K—7.64 mi. Route 53, Sect. 537—3.3 mi. Route 63, Sect. 632, all Cook Co.—6.94 mi. Route 47, Sect. 126, Pord Co.—8.58 mi. Route 53, Sect. 536, Will and Cook Counties—5.2 mi. Route 54 Sect. 543, DuPage Co.—5.1 mi. Route 54, Sect. 544, Dupage and Will Counties—1.1 mi. Route 55, Sect. 552, DuPage Co.—5.7 mi. Route 72, Sect. 125, De Kalb Co.—1.46 mi. Route 78, Sect. 127, Henry Co.—7.56 mi. Route 78, Sect. 141, Mason Co.—4.86 mi. Route 91, Sect. 108, Knox Co.—6.22 mi. Route 121, Sect. 105, Tazewell Co.—8.7 mi. Route 147, Sect. 120, Pulaski Co.—0.97 mi. Route 176, Sect. 144-K and 0.48 mi. Route 176, Sect. 145-K, Lake Co.—1.82 mi. Route Sen. Bill 268-P-6, La Salle Co.—also three 50 ft. span rein.-con. girder bridge, Route 55, Sect. 552-B, DuPage Co. F. T. Sheets, hy. engr.

Ill., De Kalb—July 28, by City, G. N. Blackman, city clk., grading, curbing, guttering, sewers, concrete walks, paving 7,040 sq.yd. Oak St. W. M. Hay, De Kalb, engr.

Indianapolis—July 29, by State Hy. Dpt., Indianapolis, improving Road 162, Sect. A, Spencer Co., incl. 15,398 cu. yd. excav., 185 cu. yd. concrete, 12,127 lb. reinforcing, 160 lin. ft. concrete pipe. J. J. Brown, dir.

Ind., Auburn—Aug. 5, by Bd. Comrs. De Kalb Co., concrete surfacing 2 mi. Cedar Chapel Rd., $10,000—5.1 mi. Spencerville Rd., $20,000—2 mi. Stockley Rd., $10,000—2.25 mi. Phillips Rd., $10,000. C. T. Miser, Auburn, engr.

Ind., Bloomington—Aug. 5, by A. Eller, aud. Monroe Co., Court House, grading, draining, gravel, brick, crushed stone or macadam, surfacing 7.322 mi. J. D. Brighton Rd., Bean Blossom Twp.

Ind., Bloomfield — Aug. 5, by Bd. Comrs. Greene Co., graveling S. R. Hayes, et al. Rd., Jefferson Twp. $26,420. G. R. Hudson, aud.

Ind., Crawfordsville—Aug. 5, by Bd. Comrs. Montgomery Co., at office P. Stump, aud., Courthouse, graveling Leighty Brothers, et al. Rd., Scott and Brown Twps. $25,000.

Ind., Ft. Wayne—Aug. 2, by Bd. Comrs. Allen Co., concrete surfacing 15 mi. Monroeville Rd. $352,000. G. W. Grosvenor, Ft. Wayne, engr.

Ind., Newcastle—Aug. 4, by Bd. Comrs. Henry Co., concrete surfacing E. G. McQuinn Rd. $45,000. J. R. Leakey, Newcastle, aud.

Ind., Plymouth—Aug. 5, by Bd. Comrs. Marshall Co., graveling John Eckert, Jesse Senff and Sigmund Rds. $38,207. O. H. Weber, Plymouth, aud.

Ind., Winchester — Aug. 5, by Bd. Comrs. Randolph Co., bituminous surfacing 2 roads. $41,527. I. E. Smithson, Winchester, aud.

Streets and Roads (Continued)

Ia., Iowa City—Aug. 1, by City, concrete paving, $58,000; contract for sewer drain system at airport, to J. Strahle, Iowa City, $9,203.

Kansas—Aug. 8, by State Hy. Dpt., at Wellington, sand gravel or chats surfacing 7.498 mi. Project 49-3-K 748-B, Sumner Co. W. V. Buck, State House, Topeka, hy. engr.

Kan., Norton—July 30, by E. L. Guthrie, city clk., grading, curbing, concrete paving 11 blocks.

Maryland—July 29, by State Roads Comn., Baltimore, constructing 13 sections of hys. in Allegheny, Anne Arundel, Baltimore, Carolina, Carroll, Charles, Howard, Montgomery, Prince Georges, St. Marys and Wicomico Counties. G. C. Uhl, chn.; adv. E. N.-R. July 24.

Massachusetts — July 29, by Dpt. P. Wks., State House, Boston, bituminous macadam paving 2.319 ft. hy. in Holden—6,000 ft. South Hadley—3,300 ft. Charlton—steel bridge, gravel and bituminous treating 3.314 ft. Newbury. A. W. Dean, c/o Dpt. P. Wks., Boston, engr.

Massachusetts—Dpt. P. Wks., State House, Boston, rescinded contract rein.-con. paving 28,447 ft. hys. in Shrewsbury, Northborough and Westborough-Sect. B, Boston Worcester Turnpike. A. W. Dean, c/o Dpt. P. Wks., engr. Will readvertise. Noted July 10.

Massachusetts — July 29, by State Dpt. P. Wks., State House, Boston, rein.-con. paving 11,450 ft. hy. in North Attleboro. A. W. Dean, c/o owner, engr.

Mass., Boston — July 28, by Dpt. P. Wks., J. A. Rourke, comr., City Hall, sheet asphalt or bituminous paving Lamartime St., Ward 19. $25,000.

Mass., Boston — July 29, by Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt or bitulithic paving Townsend St., Wards 11 and 12. $30,000.

Mass., Boston—July 31, by Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt or bitulithic paving Centre St., Ward 16. $25,000.

Mass., Marlborough—July 28, by Street Dpt., J. F. Granger, supt., vulcanized sheet asphalt paving Main St. $25,000.

Michigan—July 29, by E. R. Benkert, resident engr., Port Huron, grading, concrete paving 0.436 mi. Ass. Dist. 1141, Contr. 1, Sanilac Co.; 4.987 mi. Mo-79-32-C-2, Tuscola Co., 20 ft., for State Hy. Comn., Lansing.

Michigan—July 30, by E. D. Crandall, resident engr., Cadillac, grading, 2 course graveling 6.424 mi. Fo 57-17-1 and Mo 57-17C-2, Missaukee Co., 18 ft., for State Hy. Comn., Lansing.

Mich., Detroit—July 25, by H. W. Busch, Comr. Park & Blvds., 8 in. one course concrete paving 29,860 sq. yd. River Rouge Park Rd. $60,000. P. A. Fellows, city engr.

Minnesota—Aug. 5, by State Hy. Comn., St. Paul, concrete paving 12,600 sq.yd. State Project 11-40, near Eveleth. $25,000. State furnishes cement.

Miss., Houston—City Council postponed indefinitely taking bids curbing, guttering, concrete paving 45,750 sq.yd. C. N. Harrub Eng. Co., 705 Fourth and First Natl. Bank Bldg., Nashville, Tenn., engrs.

Missouri—Aug. 1, by State Hy. Bd., Jefferson City, constructing roads in Audrain, Carroll, Cass, Clark, Iron, Jackson, Knox Lewis, Lincoln, Marion, Maries, Mercer, Miller, Moniteau, Ralls, Randolph, St. Louis, Saline, Stoddard and Worth Counties. T. H. Cutler, ch. engr.

Mo., St. Louis—Aug. 12, by Bd. Pub. Serv., vibrolithic concrete paving 1,375 sq.yd. Alsace Pl., $8,480—asphalt paving 7,340 sq.yd. Ridgewood St., $57,240—widening, paving, concrete guttering, asphalt paving 1,900 sq.yd. Chestnut St., $14,680—granite block paving 1,350 sq.yd. 11th St., $12,200. W. W. Horner, city engr.

Mo., West Plains—Bids about Aug. 15, grading, curbing, concrete paving. $30,000. Russell & Axon, 6200 Easton Ave., St. Louis, and McDaniel Bldg., Springfield, engrs.

Mont., Miles City—July 30, at office City Clerk, grading, curbing, guttering, waterworks, rein.-con. and 2 in. black topping on rein.-con. paving 147,050 sq.yd. J. W. Hall, city engr.; adv. E. N.-R. July 24.

New Hampshire — July 30, by State Hy. Comn., Concord, graveling 4.5 mi. hy. in Hoohsett and Candia.

New Hampshire — July 31, by State Hy. Comn., Concord, 6 in. one course rein.-con. on 8 in. gravel paving 56,112 sq.yd. Carroll Co. $215,000. H. L. Smith, Lakeport, engr.; 12,942 sq.yd. Grafton Co. $37,000. L. F. Johnson, Lebanon, engr.

N. J., New Brunswick — July 29, by Freeholders Middlesex Co., constructing 0.194 mi. Cranbury-South River Rd., and 2.06 mi. South Amboy-Sayreville Rd. W. F. Buchanan, New Brunswick, engr.

N. J., New Brunswick—July 29, by Bd. Freeholders Middlesex Co., County Record Bldg., rein.-con. paving Keasby Rd., Woodbridge Twp., $25,000 or more—South Amboy-Sayreville Rd. 47, Sayreville Boro, $50,000—penetration macadam paving Woodbridge-New Brunswick Turnpike, Raritan Twp. and Highland Park Boro, $25,000 or more. W. F. Buchanan, 175 Smith St., Perth Amboy, engr.

N. J., North Haledon — July 28, by Bd. Council, School House, Squaw Brook Rd., grading, bituminous penetration macadam paving Secomac Rd. from Belmont Ave. to boro line. $26,500 appropriated. F. J. Wright, 45 Church St., Paterson, boro engr.

N. J., Oakhurst—Aug. 1, by G. R. Moore, engr., Manasquan, paving 1¼ mi. West Park Ave. Rd. between Monmouth Rd. and Neptune Dr., for Twp. $70,000.

N. Y., Brooklyn—July 30, by H. Hesterberg, pres. Brooklyn Boro. Boro Hall, grading, bituminous concrete paving Rockaway Parkway, East 95th St., Sheridan, Turnbull, Van Sicklen, Van Sinderen Aves.

N. Y., Long Island City—July 28, by G. U. Harvey, pres. Queens Boro. Queens Subway Bldg., grading Van Wyck Blvd.—sheet asphalt on macadam paving Hollis Ave.—sheet asphalt on concrete paving Lefferts, Van Alst, 41st, 85th, 86th Aves., Crescent, 135th, 122nd Sts.—grading, curbing, recurbing, sidewalks on Home Lawn Ave.

N. Y., New York—July 29, by W. J. Flynn, acting pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., granite blocks on concrete paving Palisade Pl.—bituminous concrete on concrete paving Mosholu Ave.—sheet asphalt on concrete paving Longfellow Ave.—grading, curbing, sidewalks Eastern Blvd., East 215th St., Wilder and Morgan Aves.

N. Y., St. George—July 30, by J. A. Lynch, pres. Richmond Boro, Boro Hall, bituminous concrete repaving Amboy Rd., Mersereau and Waters Aves.

O., Akron—July 28, by F. E. Swineford, dir. Dpt. P. Serv., grading, curbing, vitr. brick on 6 in. concrete paving 13,950 sq.yd. Glenwood Ave., $88,000; 9,250 sq.yd. Delaware and Hus Aves. $87,000. E. A. Kemmler, Municipal Bldg., engr.

O., Bellaire—July 29, by City Council, concrete paving 0.8 mi. South Belmont St. $39,000. J. Dean, Bellaire, engr.

O., Cincinnati—Aug. 1, by Comrs. Hamilton Co., asphalt bound macadam repaving 30,000 sq.yd. Drake Rd. $29,610. E. A. Gast, Court House, engr.

O., Columbus—July 29, by W. H. Duffy, serv. dir., grading, water service, sewers, brick, asphalt or concrete paving Walhala Rd., Guilford, Oakley and Woodlawn Aves. $46,000. R. H. Simpson, City Hall, engr.

O., New Philadelphia — Bd. Control, bids about Sept. 8, paving 4th St. and Northwest Blvd., asphalt $39,375, concrete $35,700 respectively. H. F. Brown, New Philadelphia, engr.

Okla., Oklahoma City—July 28, by J. G. Stearley, clk., grading, 6 in. concrete paving 7,450 sq. yd. driveways, 36,660 sq. ft. side walks on public school grounds. $26,000. W. O. Moore, 400 North Walnut St., engr.

Okla., Tulsa — Aug. 1, by Bd. City Comn., grading, curbing, drainage, petroleum asphalt paving 4,969 sq.yd. Street Impvt. Dist. 1042 (3rd St.). $33,564. H. A. Parker, Municipal Bldg., engr.

Pa., Charleroi—Aug. 5, by R. A. Roberts, secy., Boro Bldg., grading, paving, curbing, paving 2,000 sq.yd. Prospect Ave. $25,000. McDonald & Bigler, Municipal Bldg., engr.

Pa., Glassport—Aug. 11, by City Council, grading, curbing, sewers 0.25 mi. concrete paving, ½ mi. brick paving 2 streets. A. Hutchison, Dilkinsburg, engr.

Pa., Port Allegheny—July 31, by F. S. Cook, secy., Boro Bldg., grading, shoulders, ditches, rein.-con. paving 2,698 sq.yd. Pearl St. and Taber Ave. E. J. Clohessy, Boro Bldg., engr.

S. C., Beaufort—July 29, by State Hy. Comn., Jefferson Hotel, Columbia, grading, concrete paving 0.404 mi. Bladen St., 20 ft., Beaufort Co. B. M. Sawyer, ch. hy. engr.

Tennessee—Aug. 1, by State Dpt. Hys. & P. Wks., Nashville **(S.A.P. means State Aid Project)**, grading, shoulders, concrete surfacing 3.188 mi. State Hy. 14, S.A.P. 218-B-S Shelby Co.—grading, drainage structures 4.24 mi. State Hy. 11, S.A.P. 382-E Robertson Co.—12.68 mi. State Hy. 73, S.A.P. 504-B Cocke Co.—12.095 mi. State Hy. 100, S.A.P. 534-C Chester Co.—10.043 mi. State Hy. 53, S.A.P. 543-C Coffee Co.—6.641 mi. State Hy. 106, S.A.P. 545-A Davidson Co.—concrete bridge, approaches over Cane Creek, State Hy. 100, Federal Aid Project 236-B Hickman Co.—3 bridges over 20 ft. span, S.A.P. 534-C Chester Co. R. H. Baker, hy. engr.

Tennessee—Aug. 8, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, paving 10.6 mi. State Hy. 5, Martin-State Line Rd., Weakley and Obion Counties—grading, drainage structures 16 mi. Hy. 15, Fayettesville-Franklin Co. line Rd., Lincoln Co.—1.3 mi. Hy. 38, St. Elmo-Lookout Creek Rd., Hamilton Co.—6 mi. Hy. 76, Clarksville-Stewart Co. line Rd., Montgomery Co.—Hy. 100, Decatur and Chester Co. line Rd., Henderson Co.—2 bridges, approaches Hy. 53, Manchester-Cannon line Co. Rd. R. H. Baker, ch. hy. engr.

Texas—July 31, by G. Gilchrist, engr., State Hy. Dpt., Austin, grading, paving 165.21 mi. 15 projects in Aransas, Childress, Ector, Ellis, Harris, Haskell, Hopkins, Lubbock, Knox, San Jacinto, Tarrant, Galveston, McLennan and Navarro Counties, for State Hy. Comn. $1,450,000.

Tex., Amarillo — Bids about July 20, alternate types paving 8 blocks North Williams St. $30,000. E. N. Stanley, City Hall, engr.

Tex., Kingsville—Comrs. Kleberg Co., bids about Sept. 15, grading, bridging 12 mi. new hy. from here to Jim Wells Co. line, 18 ft. $100,000.

Wash., Seattle—Aug. 4, by Comrs. King Co., realignment 1.5 mi. Redmond-Issaquah Rd., Road Revision 1, grading, graveling 2 mi. Three Tree Point Rd. T. D. Hunt, Seattle, co. engr.

Wash., Seattle—Aug. 11, by Comrs. King Co., regrading, graveling 4.6 mi. Enumclaw-Selleck Rd.—concrete paving 5.2 mi. 15th Ave. N.E.—constructing, 1 mi. Mount St. Rd., incl. bridge. T. D. Hunt, Seattle, co. engr.

W. Va., Madison—Aug. 2, by Court Boone Co., clearing right-of-way, drainage structures, grading 4.4 mi. Big Creek Rd., Project 5. 2.2 mi. Mud Fork Rd., Project 7. C. H. Nelson, co. clk.

W. Va., Middlebourne — Aug. 12, by Bd. Comrs. Court Tyler Co., crushed slag surfacing 10.75 mi. Indian Creek Rd. E. Ash, pres.

W. Va., Moundsville—July 28, at office L. L. Stidger, city clk., 6th St., rein.-con. or brick on concrete surfacing 5 streets and 1 avenue.

W. Va., West Union—Aug. 4, by H. Maxwell, clk. Doddridge Co., amiesite surfacing 2 mi. or tarvia composition or oil surfacing 4 mi. Center Point Rd., McLellan Dist., 1 mi. oil or tarvia retread on rock run telford base road in West Union Dist.

Wisconsin — July 30, by State and Adams, Portage and Waushara Co. Hy. Comns., at Div. 4, Wis. Hy. Comn., Citizens Natl. Bank Bldg., Wisconsin Rapids, grading, concrete paving 10.923 mi. Wautoma-Plainfield-Nekoosa Rd.

Wisconsin—July 31, by State and Washington Co. Hy. Comns., Div. Office 2, Commerce Bldg., Milwaukee, grading, concrete surfacing 5.4 mi. West Bend-Newburg Rd., S.T.H. 33, F.A.P. 444; 0.619 mi. Main St., Kewaskum.

Wis., Wauwatosa—Aug. 1, by Bd. P. Wks., grading, curbing, guttering, sidewalks, concrete paving Greenfield Ave.—concrete paving Thornapple Parkway, Glenn Pl., Ravenswood and Glencoe Circles, 85th, 89th, 60th, Clark, Eagle and Center Sts. J. E. Torkelson, city engr.

CONTRACTS AWARDED

California—State Hy. Dpt., Sacramento, untreated crushed gravel or stone on crusher run surfacing 7.2 mi. Airport-Yuba Pass Rd., Placer and Nevada Counties, to Tieslau Bros., 2819 Grove St., Berkeley, $122,807. Noted June 12.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, curbing, walks, asphaltic concrete paving Western Ave., to Los Angeles Paving Co., 3200 East Vernon Ave., $117,290. Noted June 26.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, curbing, walks, guttering, concrete paving Cahuenga Blvd., to W. F. Peck Co., 1120 Las Palmas St., $813,615—Barrington Ave. and Rochester Ave., Impvt. Dist., also 256th St., to G. H. Oswald, 366 East 58th St., $88,490 and $29,565 respectively. Grand total $931,670.

Calif., Los Angeles—Bd. P. Wks., City Hall, improving 36,000 ft. Main St., to G. H. Oswald, 366 East 58th St., $426,129, est. $506,070; 20,028 ft. Sunset Blvd., to W. F. Crawford, 6900 Washington Blvd., $563,648 est. $702,913.

Calif., Santa Ana — Orange Co., improving 6.2 mi. Ortega Hy., Joint Hy. Dist. 15, incl. clearing and grubbing right-of-way, 327,500 cu.yd. excav., 960 sta.yd. overhaul, to H. W. Rohl Co., Roosevelt Bldg., Los Angeles, $173,260.

Calif., Yuba City—Sutter Co. asphaltic concrete with 5 in. crusher run base surfacing Woodland-Yuba City Cut-off, to J. E. Johnston, Savings & Loan Bldg., Stockton, $212,262.

Colorado—State Hy. Dpt., Denver, improving Santa Fe Trail near Avondale, Pueblo Co., to Lumsden-Hall Constr. Co., Grand Junction, $30,330.

Conn., Bristol—To F. Helming, 67 West St., grading; to C. Vacca, Terry Rd., sidewalks at $0.18, gutters $0.19, curbs $0.45. Est. $25,000.

Ga., Decatur—Asphaltic concrete repaving 28,000 sq. yd. College Ave., to S. E. Finley, 212 North Ave., Atlanta, $30,118. Est. $30,000.

Idaho—At office J. D. Wood, comr. P. Wks., Boise, grading, crushed rock surfacing 8.917 mi. Sawtooth Park Hy. between Hailey and Lincoln Co. line, Blaine Co., and grading, drainage structures, crushed gravel surfacing 10.019 mi. Sawtooth Park Hy. between Blaine Co. line and Shoshone, Lincoln Co., to Quinn-Robbins Co., Boise, $63,080 and $94,490 respectively.

Idaho—Commissioner Dpt. P. Wks., Boise, oiling 25.855 mi. North and South Hy., Kootenai and Bonner Counties, also 17.723 mi. North and South Hy., Cottonwood-Grangeville Sect., and 0.53 mi. Camas Prairie Hy., Idaho Co., to Hargrave Constr. Co., Spokane, Wash., $20,653 and $15,798 respectively.

Ill., Alton—Curbing, guttering, concrete paving West 19th and Hayden Street Paving & Sewer Impvt. Dist., to Strubbel & Helmich, 1852 Evergreen St., $21,041; 7,660 sq.yd. Powhatan Paving Dist., to J. B. Miller, 519 Belle St., $21,213.

Ill., Chicago—Bd. Local Impvts., City Hall, removing trees, old surface, curb and gutter, grading, curbing, guttering, sewers, widening asphalt on 8 in. concrete paving street and 5 in. granite block on 1½ in. sand or limestone surfacing 2½ ft. on each side, concrete combined sidewalks and curb between curbline and street, and concrete walls, on North La Salle St., to White Paving Co., 1735 Fullerton Ave., $350,000.

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Streets and Roads (Continued)

Ill., Chicago—Bd. Local Impvts., City Hall, concrete sidewalks on West Adams, North Clark, South Wells, Sedgwick, Weed, North Des Plaines, West Erie, West Illinois, West Madison and West Randolph Sts., West Chicago, South 5th and Claybourn Aves., to A. Graff & Co., 50 North La Salle St.—Blue Island Ave., West Lake, West Washington and North Wells Sts., to Banner Constr. Co., 384 North Harding Ave. —West Harrison, Sherman, East 31st, at West Van Buren, Eaton, West Lake, North Des Plaines, West 14th, East 92nd and West 18th Sts., Cottage, Commercial, South Chicago, Archer and South Union Aves., to J. C. Jensen, 163 West Washington St.—West Roosevelt Rd., West Division, West 14th, South Clinton, West Van Buren, Orleans, West Superior Sts., Blue Island, Cottage Grove and West North Aves., to Superior Constr. Co., 1109 East 52nd St.—Cottage Grove Ave., North Franklin, North Halsted, West Lake, West Division, and North Dearborn Sts., to Simpson Constr. Co., 120 South La Salle St.—North Ashland and Rush Sts., to Aldrich Constr. Co., 140 South Dearborn St. Noted June 26.

Ill., Chicago—Bd .Local Impvts., City Hall, grading, curbing, guttering, sewers, asphalt on 6 in. concrete surfacing South Aves., Drexel and Indiana Aves., to R. P. Conway Co., 844 Rush St.—North California, North Neenah, Highland, Palatine, North Hoyne and New Hampshire Aves., to White Paving Co., 1735 Fullerton Ave.; East 65th St. and Claremont Ave., to America Asphalt Paving Co., 133 West Washington St.—grading, curbing, guttering, sewers, 8 in. concrete paving North Kilbourn Ave., to Paramount Paving Co., 82 West Washington St.—North Whipple St., to J. A. Ross & Co., 4561 Armitage Ave.

Ind., Anderson — Bd. Comrs. Madison Co., curbing, concrete paving 1.5 mi. Keltner Rd. (West 10th St.), 30 ft., to E. E. Lyst, Anderson, $49,900. Est. $57,000. Noted Apr. 24.

Ind., Auburn—DeKalb Co. graveling Scattergood Rd., to Betts & Essinger, Columbus City, $8,248; Shoemaker Rd., to Baker & Dunn, St. Joe, $16,894.

Ind., Evansville—Vanderburg Co., asphaltic concrete paving Covert Ave., to L. Reichert Constr. Co., Evansville, $48,779. Est. $48,880. Noted June 26.

Ind., New Castle—Henry Co., Kentucky rock on crushed stone surfacing 6 mi. J. S. Leakey Rd., to L. Martine, Laporte, $96,641.

Ind., Peru—Miami Co., graveling Waymire Rd., to J. W. Morrison, Deedsville, $9,150—Russell Rd., to Bowser & Scott, Bunker Hill, $9,216—Hedrick Rd., to B. P. Hatfield, Converse, $8,157. Grand total $26,523. Est. $29,410. Noted June 26.

Ind., Princeton—Gibson Co., gravel surfacing 3 mi., Yeager Rd., to W. H. Lefler, Francisco, $15,735—rock and gravel surfacing 1 mi. Westfield Rd., to R. D. Manning, Princeton, $9,100—concrete surfacing 1.300 ft. Locust St., to G. Soller, Princeton, $5,690. Grand total $30,425. Noted July 3.

Ind., Rensselaer—Jasper Co., to W. C. Babcock, Rensselaer, stone surfacing 1 mi. Fleming Rd., $4,998; 2¼ mi. Kirk Rd., $10,497; ¼ mi. Hurley Rd., $3,359—to F. Fenwick, Brook, 2 mi. Bernhardt Rd., $7,767. Grand total $26,621. Noted July 2.

Ind., Terre Haute—Vigo Co., concrete surfacing 3 mi. Robinson Rd., and 1 mi. Beek Rd., to J. A. Sheperd, Terre Haute, $83,811 and $20,902 respectively, est. $98,162 and $25,619 respectively. Noted June 26.

Ind., Valparaiso — Bd. Comrs. Porter Co., stone surfacing 4.1 mi. Wolbrandt-Swanson Rd., to F. Schirr, Westville, $34,325 — 1.78 mi. Nelson Rd., to W. St. Clair, Valparaiso, $19,900—Adams Rd., to E. Coash, Valparaiso, $3,970—Trede Rd., to R. De Mass., Chesterton, $12,800. Grand total $71,095. Noted June 12.

Ia., Carroll—July 28, at office Auditor Carroll Co., graveling 5 mi. local roads. J. F. Maher, Carroll, co. engr.

Ia., Council Bluffs—Pottawattamie Co., grading trunk road system, to E. J. Wilson & Son, Omaha, Neb., $28,077.

Ia., Ft. Madison—Lee Co., improving 12.513 mi. roads, incl. 108,035 cu.yd. earth, 100 cu.yd. loose rock and 100 cu.yd. solid rock excav., 86,437 cu.yd. overhaul, to Swanson Constr. Co., Keokuk, $27,898. Noted June 5.

Ind., Winamac—Comrs. Pulaski Co., stone surfacing Freeman and Spurgeon Rds., to Johnson Gravel & Constr. Co., North Judson, $12,495—Conner Rd., to S. Browning, Royal Center, $10,678—Mayhugh Rd., to Alberding & Kroft, Winamac, $10,153. Grand total $33,326. Est. $40,931. Noted June 26.

Ia., Marshalltown — Marshall Co., grading secondary road system, to A. A. Bainter, Marshalltown, $2,234; graveling, to M. O. Weaver, Iowa Falls, $26,103. Noted July 3.

Ia., Marshalltown—Grading, curbing, concrete paving 10,015 sq.yd. 1 alley, East Main, West Church, North 10th, South 3rd, West Madison and Southerland Aves., to D. J. Ryan Constr. Co., 1st Natl. Bank Bldg., Davenport, $38,580. Est. $41,603. Noted June 12.

Ia., Newton—Jasper Co., graveling, maintenance graveling 21 mi. Projects A-Div. 4, G-Div. 1 and T-Div. 2, to L. W. Hayes, Newton, $29,897.

Ia., Rockwell City — Calhoun Co. graveling secondary roads, to J. F. Onnen, Rockwell City, $8,489—and to A. R. Eno, Rockwell City, $15,889—grading, to L. J. Hartman, Laurens, $1,587—and to W. Rodewald, Rockwell City, $8,909. Grand total $34,874.

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Ia., Sigourney—Lee Co., grading trunk and lateral roads, to Swanson Constr. Co., Keokuk, $27,538.

Ia., Williamsburg — Grading, curbing, concrete paving 17,000 sq.yd. 10 streets, to Ford Paving Co., 290 Merchants Natl. Bank Bldg., Cedar Rapids, $36,890.

Kansas—State Hy. Dpt., Topeka, to Cook & Cone, Ottawa, **(P. means Project)** graveling 6 mi. P-508-29-7036 $1,680; 7.5 mi. P-508-28-7037 $2,100, both Chase Co.; 4.5 mi. P-508-27-2-31 $1,260; 7.5 mi. P-508-25-7033 $4,200; 5.3 mi. P-508-26-7032 $2,968, all Marion Co. —to Reed & Wheelock, Clay Center, 4 mi. Cloud Co. $2,080—to Thogmartin & Reis, Ft. Scott, 8 mi. Cloud Co. $4,992; 11.35 mi. Geary Co. $4,949; 5.3 mi. Ottawa Co. $2,521—to San Ore Constr. Co., McPherson, 6 mi. Ellsworth Co. $2,760, 8.5 mi. McPherson Co. $5,100—to W. D. Shay, McPherson, 10 mi. McPherson Co. $5,960 — to A. Davidson Constr. Co., Beatrice, 11.7 mi. Republic Co. $6,305—to D. H. Hardman, Alton, 17 mi. Republic Co. $6,758—to Collins Constr. Co., Leavenworth, 1.362 mi. P-31-7057 Allison Co. $431, 0.473 mi. P-4-31-7050 $159; 5 mi. P-16-30-7058 $1,585, both Atchison Co.—to B. Metzger, Ozawkie, 2 mi. Douglas Co. $510; 3 mi. P-50-44-7054 $756, 7 mi. P-50-44-7055 $1,785; 5 mi. P-50-44-7056 $1,140, all Johnson Co.; 3 mi. Leavenworth Co. $897; 6 mi. Lyon Co. $1,788; 7.452 mi. Shawnee Co. $3,010—to M. W. Watson, Mulvane Bldg., Topeka, 15.5 mi. Wabaunsee Co. $5,107. Grand total $70,861.

Kansas—State Hy. Dpt., Topeka, **(P. means Project)** to Geiger & Rutherford, Leavenworth, sand clay surfacing 12.641 mi. Ford Co. $14,964—to Yant Constr. Co., 905 Omaha Natl. Bank Bldg., Omaha, Neb., 22.868 mi. P-45-6-FA 416-A $36,197; 0.673 mi. P-45-6-K 1078 $1,008; 1.213 mi. Project 4506-K 1079 $1,922, all Gray Co.—to San Ore Constr. Co., McPherson, 6.03 mi. P-83-5-K 1071 $9,045; 6.043 mi. P-83-5-K 1072 $9,065; 6.043 mi. P-83-6-K 1073 $9,019; 6.025 mi. P-83-7-K 1074 9,035, all Haskell Co.—to Western Bridge & Constr. Co., 3867 Leavenworth St., Omaha, Neb., 5.497 mi. P-5ON-8-FA 295-C $8,260; 10.822 mi. P-5ON-8-K 1075 $16,300; 5.958 mi. P-5ON-8-K 1076 $8,980, all Hodgeman Co.—to W. D. Shay, McPherson, 3.766 mi. Meade Co. $6,893 —to A. L. Cook, Ottawa, grading 12.047 mi. Haskell Co. $25,004; 8.637 mi. Stevens Co. $21,505. Grand total $177,197.

Kansas—State Hy. Comn., at Sublette, sand surfacing 22.868 mi. road in Gray Co., to Yant Constr. Co., 905 Omaha Natl. Bank Bldg., Omaha, Neb., $36,197; grading, culverts 12.047 mi. Haskell Co., to A. L. Cook, Ottawa, $25,004. Noted July 14 Daily.

Kan., Westmoreland—Pottawatomie Co., graveling 18 mi. Sects. A and B Project 8, to Thogmartin & Reis, Ft. Scott, $26,526; grading, culverts on 10.11 mi. Sect. B, own forces.

Kentucky—State Hy. Dpt., Frankfort, rein.-con. paving 6.406 mi. Fulton-Bardwell Rd., Hickman Co., to N. E. Stone & Co., Madisonville, $120,282. Rejected bids June 17, surfacing 15.839 mi. Louisville Paducah Rd., Breckinridge Co.—8.69 mi. Hawesville-Cloverport Rd., F.A.-46-C.S. Hancock Co. and F.A.37-B28 Breckenridge Co.—5.332 mi. Clinton-Bardwell Rd., F.A.-131-E-8 Hickman Co.—12.226 mi. Whitley City-Somerset Rd., F.A.170-C8 McCreary Co.—9.788 mi. same road, F.A.110-A8 Pulaski Co. J. S. Watkins, hy. engr. Noted May 15.

Me., Portland—Rein.-con. paving 19,610 sq. yd., granite block paving 6,510 sq.yd., to J. H. Kerr, Rumford, $75,704. Noted June 19.

Maryland—State Rds. Conn., Baltimore, concrete paving 0.73 mi. Anne Arundel Co., to G. & L. Contg. Co., Maple Ave., Overlea, Baltimore, $11,913—1.3 mi. Wicomico Co., to Layfield & Waller Paving Co., Salisbury, $32,848—penetration macadam paving 4.5 mi. Talbot Co., to P. D. Phillips & Bro., Salisbury, $64,496. Grand total, $109,257. Noted June 19.

Mass., Attleboro — Granolithic sidewalks as directed, to H. F. Lull Est., 308 Main St., Pawtucket, R. I., at $1.97 per sq.yd. Est. $25,000.

Mass., Brookline—Town, Bd. Selectmen, grading, surfacing, sewers, drains in Bellingham Rd., to E. O'Toole Sand & Gravel Co., Everett St., Norwood. Est. $25,000 or more.

Mass., Stoneham—Town, Bd. Selectmen, 1,000 sq.yd. new tar concrete sidewalks and repairing 1,500 sq.yd. old sidewalks, to T. A. Mulroney, 13 Avon St., at $1.12 per sq.yd.

Mass., Waltham—For 10,000 sq.yd. tar concrete sidewalks, driveways, to J. S. Hayes, 22 Grant Pl. Est. $25,000 or more.

Michigan—L. N. Jones, resident engr., Crystal Falls, grading, shaping, concrete paving 1.2 mi. MO22-24C-2, 20 ft., Dickinson Co., for State Hy. Dpt., Lansing, to Bacco Constr. Co., Iron Mountain, $34,166. Noted June 12.

Michigan—State Hy. Dpt., Lansing, Grading, concrete paving 0.638 mi. Kent Co., 40 ft., to Marsman & Taber, Grand Rapids $40,846 (incl. cement); grading, drainage structures 7.942 mi. Mackinaw Co., to Rogers Constr. Co., Petoskey, $126,013 (incl. cement).

Mich., Pontiac—Oakland Co., Rd. Comn. grading, shaping, Class "F" concrete paving ¼ mi. Assessment Dist. Rd. 157, to M. E. Hull, Dryden, $35,338; shaping, draining, Class F. concrete paving ½ mi. Assessment Dist. Rd. 158, to Bartling & Dull, Pontiac, $30,785, both 20 ft. wide. L. V. Belknap, Pontiac, engr.

Minn., Tower — St. Louis Co. (Duluth), paving 4.5 mi. hy., to J. W. Salo, 1215 East 11th St., Duluth, $124,542. Noted June 5.

Miss., Aberdeen — Bd. Alderman, curbing, guttering, sidewalks and rein.-con. paving 1,705 ft. High and Matuba Sts., 34 ft., to Barber Bros. Constr. Co., Bogalusa, La., at $1.57 per sq.yd. Noted June 12.

Miss., Hazelhurst — Concrete paving 5,800 sq.yd., to Cobb Brothers Constr. Co., Meridian. Noted June 26.

Miss., Kosciusko — Attala Co. Hy. Comn., graveling 36 mi. roads, to C. Hester, J. M. Sanders, V. Rainey, A. L. Allen, A. H. O'Briant, O. E. Mangrum Brown Contg. Co.: furnishing gravel, to Lyon Gravel Co., Avalon, Brookhaven Gravel Co., Brookhaven, Water & McCrary, Columbus, and Southern Sand & Gravel Co., Columbus. Noted June 19.

Miss., Yazoo City—Grading, concrete paving 90,355 sq.yd. to Wright Constr. Co., Meridian, $275,000. Noted June 19.

Missouri — State Hy. Dpt., Jefferson City, grading 4.157 mi. Carter Co., to Carter-Harlan Constr. Co., West Plains, $23,554; graveling 4.451 mi. Boone Co., to H. D. Thomas, Fulton, $23,017.

Mo., Clayton—St. Louis Co., Court House, grading, concrete paving Jennings Station Rd., to Keeley Bros. Contg. Co., 4301 State St., East St. Louis, Ill., $50,201—Denny Rd., to Webb-Boone Paving Co., 5301 Fyler Ave., St. Louis, $30,532—bituminous surfacing Graeser Rd., to Pathfinder Service Co., 8010 Forsythe Blvd., $29,054. Grand total $109,787.

Mo., Clayton—St. Louis Co., concrete paving Big Bend and Delmar Blvds., to Keeley Bros. Contg. Co., 4301 State St., East St. Louis, Ill., $101,130 and $22,760 respectively—Ladue Rd., to Moore Bros. Constr. Co., 2000 St. Clair Ave., East St. Louis, Ill., $36,447—Maryland Ave., to Flinn Paving Co., 1405 South 1st St., St. Louis, $38,375 — sidewalks, concrete paving South Milton Ave., to E. G. McKenna, 7353 Olive St., University City, $2,604—Lincoln Rd., to E. Fehlig & Co., 14 South Central St., $6,043—replacing bridge, to J. Dillon, 2358 Tennessee Ave., St. Louis, $688. Grand total $208,047. Noted July 3.

Nevada—Directors Dpt. Hys., Carson City, crushed gravel surfacing 11.65 mi. Hay Ranch-Eureka Rd., Route 2, Sects. B and C, Eureka Co., to J. N. Tedford, Fallon, $58,223; furnishing, applying asphaltic fuel oil, mixing, rebuilding shoulders 11.72 mi. Yerington-Wilson Rd., Route 3, Sects. B and B2, Lyon Co., to A. D. Drumm, Jr., Fallon, $22,173.

New Hampshire—State Hy. Comn., Concord, hy. in Lebanon, to J. F. Rooney, Milford, Mass., $14,453; bridge, to Robie Constr. Co., Woodsville, $19,063.

New Jersey—State Hy. Comn., Trenton, 9 in. rein.-con. paving 7,500 sq.yd. approach for Burlington-Bristol Bridge, Burlington Co., to E. H. Ellis, Westville, $52,850. Noted June 26.

N. J., Bergenfield—Bd. Boro Council, Boro Hall, grading, sidewalks, 6 in. concrete paving Highview and Westside Aves. to Consolidated Production Corp., 162 Beech St., Hackensack. Est. $25,000.

N. J., Egg Harbor City—Bd. City Council, City Hall, tar surfacing Campe St., Washington, London, Norfolk, Buffalo and Chicago Aves., to E. R. Moorehouse Co., Camden, $25,000 appropriated.

N. J., Hackensack — Hackensack Impvt. Comn., Municipal Bldg., curbing, widening, paving Main St., to G. M. Brewster & Son, 253 West Fort Lee Rd., Bogota, $37,915.

N. J., New Brunswick—Middlesex Co., Court House, paving Bordentown Turnpike, to C. Sebolt, New Brunswick, $26,711.

N. J., Oradell—Bd. Boro Council, Boro Hall, to G. M. Brewster & Son, 253 West Fort Lee Rd., Bogota, 6 in. penetration macadam paving Lincoln Ave. $3,990; Clinton Ave. $2,256; Hasbrouck Blvd., $4,085—to Upheil Constr. Co., New Milford, Cooper and Prospect Aves., $17,396—to F. Battaglia, 374 Jersey Ave., Fairview, Demarest Ave., $9,280—to Consolidated Production Corp., 162 Beech St., Hackensack, 6 in. rein.-con. paving High St., $7,374. Grand total, $44,381.

N. J., Westfield—Mayor and Boro Council, asphalt paving 12 streets, to A. Weyersburger & Co., Lyndhurst, $55,059.

New York—A. W. Brandt, comr. Hys., Albany, concrete paving 9.04 mi. Schenectady and Montgomery Counties, to Collins Bros., Mechanicville, $533,395 est. $674,119—3.39 mi. and 4.09 mi. Ulster Co., to J. Arborio, Poughkeepsie, $238,085 and $267,641 respectively, est. $306,767 and $355,307 respectively—6.53 mi. Cattaraugus Co., to Sweeney & Boland, 39 State St., Rochester, $282,991 est. $369,348—3.54 mi. Rensselaer Co., to New Haven Road Constr. Co., Inc., 70 College St., New Haven, Conn., $279,004 est. $363,880—3.33 mi. Schenectady Co., to J. J. Bellotte & Son, Troy, $125,260 est. $165,778—bituminous macadam paving 7.28 mi. Rensselaer and Washington Counties, to Mack Constr. Co., Indiana Lake, $297,007 est. $399,148. Grand total $2,023,383. Noted June 19.

N. Y., Syracuse—Bd. Cont. & Supply, paving Solar St., to Dale Eng. Corp., 330 Pulaski St., $54,628.

O., Canton—Widening, brick repaving 3rd St., S.E., from Market Ave. S., and Cherry Ave., to H. Corl, c/o General Delivery, $28,116; asphalt paving 7th St. N.E., from Schwalm Ave. to Belden Ave. N.E. to General Asphalt Paving Co., Witters Bldg., $25,671. Est. $25,000 each.

O., Cincinnati — Granite curbing, sidewalks, brick repaving 8,700 sq.yd. Highland Ave., to Andrews Asphalt Paving Co., 18 Pike St., Covington, Ky., $46,329 est. $54,405; asphalt paving 4,800 sq.yd. and concrete paving 8,500 sq. yd. Erie Ave., to O'Connell & Sweeney, Kellogg and Tennyson Sts., $52,151. Est. $57,480.

O., Cleveland — Asphalt paving 960 sq.yd. East 18th St., to Baldwin Bros., Union Trust Bldg. $5,308 — sheet asphalt paving 13,680

Streets and Roads (Continued)

sq.yd. Fulton Rd., to Roehl Bros., 7002 Denison Ave., $83,461—oil asphalt paving 190 sq.yd. Fairmount Rd., to Cleveland Trinidad Paving Co., Western Reserve Bldg. $1,892—2,490 sq.yd. Loretta Ave., to W. E. McHugh, West 73rd St. and Wheeling & Lake Erie R.R., $12,393. Grand total $103,054.

O., Dayton—City Comn., grading, curbing, asphalt paving 3,218 ft. Milburn Ave., 28 to 32 ft., to C. Crampton, Dayton, $21,681; 18,221 ft. West 2nd St., 32 ft., to Republic Asphalt Co., North Summitt St. and Penn R. R., $18,457.

O., Fairview (br. Cleveland)—Concrete paving Henry Rd., to Baldwin Bros., Union Trust Bldg., Cleveland, $34,987.

O., Lisbon — Asphalt resurfacing Parkway Ave., Washington, Market and Nelson Sts., to Acme Constr. Co., Alliance, $25,456. Est. $25,000.

O., Massillon — Asphalt paving Walnut Rd. S. W., also Cleveland and McKinley Aves., to Urban Bros., Massillon, $26,388 and $25,450 respectively.

O., Medina—Comrs. Medina Co., slag or limestone resurfacing 19,965 cu.yd. roads in Lafayette, Westfield, Guilford, Harrisville, Chatham, Liverpool, York, Medina Twps., to E. Deibel, Medina, $38,369.

O., Wooster — Asphalt resurfacing South Market St., to General Asphalt Paving Co., Witters Bldg., Canton, $25,000.

O., Youngstown—Widening, resurfacing Logan Ave. from Bway. to Gypsy Lane, to Kelley & Meyer Co., South Side Bank Bldg., $42,934. Est. $45,000.

Okla., Minco—Grading, concrete paving 9,250 sq.yd. Main St., to Connelly Bros. Co., El Reno, $39,144. Est. $30,529. Noted July 3.

Pa., Easton—Crushed stone concrete paving Prospect Ave., 7th, Pearl and Locust Sts., to Freeman & Zellars, Easton, at $3.29 per sq.yd. Est. $25,000.

Pa., Indiana—Indiana Co., grading 7 mi. Parkwood Rd., to J. W. Shields, Mt. Pleasant, $52,445. Noted June 19.

Pa., Sharon—Widening, paving 5,335 sq.yd. Sharpsville Ave., and brick paving 720 sq.yd. Pitt St., to W. McIntyre, 185 Budd St., Sharon, $21,004 and $3,356 respectively.

R. I., Providence—Bd. Contr. & Supply, City Hall, sheet asphalt or bituminous paving Eddy St., to Lane Constr. Corp., 134 State St., Meriden, Conn. Est. $25,000. Noted July 3.

S. D., Tyndall—Sidewalks, concrete paving, to Booth & Olson, Insurance Exch. Bldg., Sioux City, Ia., $25,000. Est. $30,000.

Tex., Beaumont—For 2 in. bitulithic on 8 in. rock paving 25 blocks Elgie, Emmett and Corley Sts., 35 ft., to Broussard-Warfield Co., Beaumont, $91,642.

Tex., Canyon — For 3 in. brick paving 12 blocks, to Harrison Constr. Co., Plainview, $32,265.

Utah — State Road Comn., Salt Lake City, gravel surfacing 10.196 mi. Elsinore-Sevier Hy., Sevier Co., to A. C. Thorne, Springville, $22,744. Est. $28,039.

Utah—State Rd. Comn., Salt Lake City, grading, graveling, 3 mi. Lincoln Hy., Salt Lake Co., to Gibbon & Reed, 1676 Beech St., Salt Lake City, $51,540.

Washington—At office S. J. Humes, dir. Hys., Olympia, crushed stone and bituminous treated surfacing 37.4 mi. State Rd. 3, Stevens and Ferry Counties, to Diesel Oil Sales Co., 115 Belmont Ave. N., Seattle, $61,931. Noted June 26.

W. Va., Charleston—Bd. Comrs. Kanawha Co., concrete paving 5.5 mi. Cabin Creek Rd., 16 ft., to Brown & Floyd, Charleston, $117,069. Noted July 3.

W. Va., St. Marys—Pleasants Co., graveling 24 mi. roads in Union and Grant Dists., to R. Shafter, Athens, O., $47,449.

Wisconsin—State and Dodge Co. Hy. Comns., Court House, Juneau, grading, concrete paving 53,266 sq.yd. Mayville-LeRoy Rd., to Koepke Bros., Appleton, $54,663. Noted July 3.

Wisconsin — State and Walworth Co. Hy. Comns., Court House, Elkhorn, concrete paving Delavan-Lake Geneva Rd. S.P. 2922, to R. R. Birdsall & Sons Co., Racine, $94,379—Hartwell Relocation S.P. 2981, and Walworth County Farm Rd., Project 2943, to Whitewater Bridge Co., Whitewater, $11,636 and $23,863 respectively—Sharon-Darien Rd., Co. Trunk C. to L. L. Tindall, Waterford, $26,665. Grand total $156,543. Noted July 3.

Wisconsin—State Hy. and Grand and Richland Co. Hy. Comns., concrete surfacing 0.64 mi. Preston-Montfort Rd. and Fountain St. and 0.59 mi. Richland Center, Bosstown Rd. S.P. 9350, to J. L. Frame, Blue Mound, $10,387 and $14,539 respectively—Hickok Bridge, S.P. 9346, to Feller Bros., Rochester, Minn., $13,797. Grand total $38,722. Noted July 3.

Wis., Milwaukee—Dpt. P. Wks., D. McKeith, comr., to Schwern Bros., 1703 Weil St., improving alley between 17th and 18th Aves. $14,625; alley between South 16th and 17th Sts. $1,677—to Parkinson Constr. Co., 3513 Highland Ave., alley between 23rd and 24th Sts., $1,781; alley between North 14th and 15th Sts. $1,569; North 23rd and Hope Sts. $508; West Capitol Dr., $3,363; to J. C. Bluhm & Son, 1299 Achilles Ave., alley between North 12th and Green Bay Rd., $918—to Gumz & Switalski, 831 13th Ave., West Forest Home Ave., $3,374; West Ridge Court, $13,478; South 13th St. $33,914; South 35th St. $4,649; North Green Bay Ave., $51,245—to Czerwinski Constr. Co., 816 Clinton St., North 28th St., $13,065; South Whitnall Ave., $25,446—to J. D. Bonness, 1460 Green Bay Rd., North 49th St. $6,723. Grand total $176,335.

Ont., Brockville — Dpt. P. Hys., Toronto, macadam paving, bridging from Brockkville northerly, to Grant Bros. Constr. Co. Ltd., Ottawa. Noted June 12.

Ont., Hamilton—City, asphalt paving Cavell Ave. from Entrance to McMaster University, day labor. $34,325. W. L. McFaul, city engr.

Ont., Port Arthur—Dpt. Northern Development, Parliament Bldgs., Toronto, grading, scarifying, 3 in. retread surfacing 10 mi. Nipigon Hy., to J. Hewitson, Port Arthur. Est. $50,000.

Ont., Sudbury—City, bitulithic on concrete paving Lane, Baker Beech and Pine Sts., to Warren Bituminous Paving Co., 54 University Ave., Toronto, $50,000.

Ont., Toronto — Asphaltic concrete paving Keewaten Ave., to Asphaltic Concrete Co. Ltd., Sun Life Bldg., $9,440 — bitulithic paving Unsworth Ave., to Warren Bituminous Paving Co., 54 University Ave., $7,429—asphalt paving Gladstone Ave., to Godson Contg. Co. Ltd., 203 Richmond St. W., $10,467—Holly St., to Kilmer & Barber, Harbor Conn. Bldg., $10,303. Grand total $37,639.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ill., Quincy—City preliminary plans rein.-con. barge and railroad terminal on river front to serve Inland Waterways Corp. $70,000. W. F. Schulz, Shrine Bldg., Memphis, Tenn., engr.

Ind., Gary — City, Burns Ditch Extension, draining swamplands into Calumet River. $27,000. A. P. Melton, Gary, engr.

Massachusetts—State Dpt. P. Wks., Boston, and towns of Yarmouth and Dennis, dredging, riprapping Bass River between above towns. $27,500. A. W. Dean, Dpt. P. Wks., Boston, engr.

Miss., Gulfport—Harrison Co. soon takes bids 7,000 ft. rein.-con. step, convex or concave seawall on shore Gulf of Mexico, west of Biloxi. $120,000. B. Bonham, Gulfport, engr.

N. J., New Brunswick—Port Raritan Dist. Comn., South Amboy, preliminary plans straightening channel between Washington Canal and here. $135,000. S. J. Mason, Runyan St., resident engr.

BIDS ASKED

Conn., Hartford—Aug. 19, by Bd. Contr. & Supply, J. A. Bush, secy., constructing South Meadows Dike. R. N. Clark, city mgr.; adv. E. N.-R. July 24.

Kan., Wichita—Aug. 2, by Bd. Comrs. Protection & Riverside Drainage Dists., c/o R. C. Foulston, 608 Fourth Natl. Bank Bldg., 11.5 mi. channels on Cowskin Creek, Protection Dist., incl. 711,268 cu.yd. excav., 248 stations bank clearing, 216 ft. 12- to 36-in. corrugated pipe, three 12 in., five 18 in. and one 36 in. sluice gates; 2.6 mi. Big Slough in Protection Dist., incl. 79,048 cu.yd. excav., 72 ft. 12 in. and 120 ft. 18 in. corrugated metal pipe, three 12 and five 18 in. sluice gates; 5.6 mi. Big Slough in Riverside Dist., incl. 336,700 cu.yd. excav., also clearing. Kansas Eng. Co., 601 Kansas Ave., Topeka, engrs. Noted June 12.

N. Y., Albany—Aug. 1, by Albany Port Dist. Comn., 74 Chapel St., excavating harbor turning basin and car ferry slip, with approaches, constructing protective dikes, and excavating and depositing material for street and roadway embankments on east side Hudson River, at Rensselaer, Rensselaer Co., Contr. 21. A. G. Chapman, ch. engr. Noted Mar. 13.

CONTRACTS AWARDED

Ill., McLeansboro—North Fork Special Drainage District, ditch work, incl. 214,000 cu.yd. excav., to J. P. Babcock, Paris, at $0.0794 per cu.yd.

Ind., Washington—Daviess Co., constructing James Hardy Ditch, to Morgan P. Wills, 609 Medical Arts Bldg., Indianapolis, $81,898. Noted June 26.

Mass., Boston — Commonwealth of Massachusetts, State House, dredging west dock Staples Wharf, to J. S. Packard Dredging Co., Turks Head Bldg., Providence, R. I., $2,265; off India Wharf, and between Cunard Docks and Main Ship Channel, both in Boston Harbor, to Bay State Dredging & Contg. Co., 62 Condor St., East Boston, $14,420 and $17,820 respectively. Grand total $35,505.

Mass., Provincetown — Commonwealth of Massachusetts, State House, Boston, 2,200 ft. sand marsh and timber dike across Race Run on Province Lands, to F. H. Barry, Willow St., Scituate, $18,750.

N. Y., Buffalo—G. F. Fisk, comr. P. Wks., Municipal Bldg., 30,000 cu.yd. maintenance channel dredging in Buffalo Inner Harbor, to Great Lakes Dredge & Dock Co., Morgan Bldg., at $0.425 per cu.yd., total $120,000. Noted May 8.

Wis., Milwaukee — Bd. Park Comrs., to Bently Bros., 808 South Pierce St., 1,840 lin.ft. concrete superstructure at Lake Shore Dr., Sect. 1, at $26.83 per lin.ft., 160 lin.ft. concrete superstructure on sheet pile $49.83, 1,000-2,000 tons stone $2.45; to E. E. Gillen Co., East Water St., 3,400 ft. building up and covering rubble mound breakwater at Lake Shore Dr., Sect. 3, $28.95 per ft.

Public Bond Elections

Coming Bond Elections

Waterworks—Los Angeles, Calif., plans, $65,000.
Waterworks—Hornerville, Mo., plans, $25,000.
Sewers—Mt. Park, Okla., July 29, $25,000.
Sewers—Cordell, Okla., July 25, $39,000.
Power Plants—Soda Springs, Idaho, July 29, $30,000.

Bonds Voted

Waterworks—Livingston, Tenn., $60,000.
Waterworks—Phoenix, Ariz., W. J. Jamieson, city engr., $2,364,000.
Waterworks—Grand Forks, N. D., Burns & McDonnell, Kansas City, Mo., engrs., $225,000.
Waterworks—Bennett, Colo., $20,000.
Sewers—Phoenix, Ariz., W. J. Jamieson, city engr., $817,000.
Sewers—Tyler, Tex., $190,000.
Power Plants—Heber, Utah, $75,000.

Bonds Defeated

Sewers—Brownsville, Tex., $120,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ariz., Tucson—RADIO BEACON—U. S. Dpt. Commerce, G. D. Barr, ag., Aeronautical Division, radio beacon, near city airport. $50,000. Also plans similar ores at Yuma and Phoenix.

Calif., Los Angeles — REPAIRING REVETMENT — U. S. Eng., Los Angeles, repairing revetment reservation point, Los Angeles Harbor.

Ill., Beardstown — REVETMENT WORK — U. S. Eng., St. Louis, Mo., 244,000 sq.yd. rip rap revetment work and 16,000 cu.yd. earth work.

Pa., Pittsburgh—GUIDE WALL—U. S. Eng., Keenan Bldg., lower guide wall at Lock 1, Monongahela River.

R. I., Providence—DREDGING—U. S. Engineer, Providence, 1,160,500 cu.yd.

R. I., Providence—DREDGING—U. S. Eng., Providence, 512,400 yd. Duck Island Harbor of Refuge.

Vt., Canaan—INSPECTION STATION—Treas. Dpt., inspection station. J. A. Wetmore, archt.

C. Z., Coco Solo—ELECTRIC FREIGHT ELEVATORS—Spec. 6176—Yards & Docks, Navy Dpt., soon takes bids 2 electric freight elevators at Naval Air Station.

BIDS ASKED

California—ROAD—Aug. 5, by C. H. Sweetser, dist. engr., Pub. Rds., 461 Market St., San Francisco, grading 8.335 mi. Sect. E, Route 23, Quincy-Beckwith Natl. Forest Hy., Plumas Co.

D. C., Wash. — STEAM DISTRIBUTION SYSTEMS—Spec. 6221—July 30, by Yards & Docks, Navy Dpt., altering and constructing additions to steam distributing systems.

Ga., Fort Benning—QUARTERS—Aug. 22, by Con. Q.M., 60 non-commissioned officers and 8 company officers quarters; adv. E. N.-R. July 24.

Illinois—EARTHWORK—Aug. 7, by U. S. Eng., Memphis, Tenn., 80,000 cu.yd. earthwork in Cairo (Ill.) D. D. (Ohio River Front). Noted May 29.

Md., Annapolis — BRIDGE — Spec. 6231 — Aug. 6, by Yards & Docks, Navy Dpt., concrete, steel trestle bridge.

Mass., Cape Cod—RIP RAP—Aug. 15, by Superintendent Lighthouses, 37 Marginal St., Chelsea, 1,700 tons rip rap around foundations, Cape Cod Channel Lights 8, 15, 16, 18, 20 and upper range front and rear lights.

Mich., Detroit—DREDGING—Aug. 19, at office U. S. Engineer, Round Island Middle Ground, St. Mary's River; adv. E. N.-R. July 24.

N. J., Knowlton (mail Titusville)—GRADING, etc.—Aug. 19, by Vet. Bu., Arlington Bldg., Wash., D. C., grading, laying concrete walks, roads, installing elevators, steam, plumbing, electrical work, water and sewer distribution systems at U. S. Veteran's Hospital.

N. J., Red Bank—POST OFFICE—Aug. 13, Treas. Dpt., post office. J. A. Wetmore, acting supervr., archt., Wash., D. C.; adv. E. N.-R. July 24.

R. I., Newport—POWER PLANT—Spec. 6031—Aug. 6, by Yards & Docks, Navy Dpt., power plant.

Tex., Randolph Field—CADET MESS HALL, etc.—Aug. 15, by A. W. Parker, Q. M., Randolph Field, 2 story, basement, 105 x 240 ft., rein.-con., brick, hollow tile, stucco, cadet mess hall; two 3 story, basement, 40 x 340 ft., brick, rein.-con., tile, stucco cadet barracks building, both plain founds. E. T. Jackson, Builders Exch. Bldg., archt., and W. E. Simpson Co., 942 Milam Bldg., engr., both of San Antonio.

Tex., Randolph Field—GAS DISTRIBUTION SYSTEM, etc.—Aug. 12, (extended date) by Con. Q.M. 1- to 6-in. natural gas distribution and underground storm sewerage systems. Noted July 3.

Tex., Randolph Field—HOSPITAL—Aug. 15, by A. W. Parker, Q. M., Randolph Field, 2 story, basement, rein.-con., hollow tile, stucco hospital plant, 24,000 sq.ft. floor space, plain found. G. Willis, c/o Builders Exch. Bldg., San Antonio, archt. W. E. Simpson Co., 942 Milam Bldg., San Antonio, engrs.

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Federal Government (Continued)

Tex., Randolph Field (sta. San Antonio)—POST EXCHANGE—Aug. 6, by A. W. Parker, Q. M., Randolph Field, 1 story, 180 x 280 ft., irregular shaped, rein.-con., brick, tile, stucco, incl. cold storage plant, stores, garage and filling station, plain found. R. B. Kelly, 330 Milam Bldg., archt., and Matthews & Kenan; Smith-Young Tower Bldg., engr., both of San Antonio. Noted Feb. 27.

Vt., Burlington—RETAINING WALL—Aug. 6, by Treas. Dpt., at office Sup. Archt., retaining wall, extending driveway, at Post Office and Custom House.

Va., Fort Monroe—HOUSES—Aug. 21, by Con. Q. M., constructing thirteen 2 family brick, tile houses; adv. E. N.-R. July 24.

Va., Norfolk — DREDGING — Spec. 6223 — July 30, by Yards and Docks, Navy Dpt., dredging at Naval Operating Base, Hampton Roads. Noted July 17.

CONTRACTS AWARDED

Arkansas and Missouri—EARTHWORK—U. S. Eng., Memphis, Tenn., 48,000 cu. yd. earthwork in D. D. 25, Dunklin Co., to A. Raney, Memphis, Tenn., $13,090.

California and Nevada—ROAD—C. H. Sweetser, dist. engr., San Francisco, to Isbell Constr. Co., Carson City, Nev., grading, 14.8 mi. Mono Co., Calif., and Douglas Co., Nev., $95,512, 2.58 mi. Douglas Co., Nev., $58,271, 2.36 mi. Washoe Co., Nev., $44,876. Grand total $198,659. Noted June 19 and 26.

La., New Orleans—REINFORCING WIRES—U. S. Eng., 600,000 reinforcing wires, to L. A. Young Spring & Wire Corp., 9200 Russell St., Detroit, Mich., $123,300.

Mass., Rutland Heights — INCINERATOR — Vet. Bu., incinerator, to Jarvis Eng. Co., 51 Ellery St., Boston, $4,990. Noted June 19.

Mississippi—EARTHWORK—U. S. Eng., P. O. Box 667, Vicksburg, 608,000 cu.yd. earthwork at Catfish Point, Sect. 2, to H. B. Blanks, Tallulah, La., $145,312. Noted June 19.

Missouri—DRAINAGE SYSTEM—U. S. Eng., Memphis, Tenn., intercepting drainage system in Bird's Point—New Madrid Floodway in Mississippi and New Madrid Counties, to Clark Bros. Constr. Co., Clinton, Ia., $126,149. Noted June 19.

Nev., Hawthorne—FIRE ALARM SYSTEM—Yards & Docks, Los Angeles, Calif., fire alarm system at naval ammunition depot, to Safe Electric Co., 8952 Ellis Ave., Los Angeles, Calif., $7,998 (90 days). Noted June 19.

N. Y., Dunkirk—BREAKWATER—U. S. Eng., Buffalo, repairing 616 lin.ft. breakwater, Dunkirk Harbor, to L. A. Wells Constr. Co., 30 Euclid Arcade, Cleveland, O., $33,076. Noted June 19.

N. Y., Oswego — DREDGING — U. S. Eng., 275,000 cu.yd. in Oswego Harbor, by government plant. Former bids rejected. Noted June 26.

Tenn., Memphis — LEVEE — U. S. Eng. 1,800,000 yd. levees Lower at Frances, to Lawrence Bros. & Co., Driver, Ark., $410,400; 647,000 yd., to McWilliams Dredging Co., 75 East Wacker Dr., Chicago, Ill., $114,843; 1,865,000 yd. Upper Yazoo Levee Dist., to H. E. Culbertson Co., Union Trust Bldg., Cleveland, O., $453,941. Grand total $979,184. Noted May 22.

Wash., Chehalis—BRIDGE—U. S. Eng., Portland, Ore., rein.-con. bridge, Lewis Co., to Concrete Constr. Co., Seattle, $45,920.

RAILWAYS

PROPOSED WORK

Texas—Atchison, Topeka & Santa Fe Ry., G. W. Harris, ch. engr., 80 East Jackson Blvd., Chicago, Ill., preliminary plans 50 mi. standard gage railroad, incl. grading, ballasting, laying rails, culverts, bridges, between Spearman and Dumas.

GRADE CROSSINGS

PROPOSED WORK

N. J., Midland Park—Bd. Council, Boro Hall, eliminating grade crossing at Secomas Ave. and Erie R.R. $104,000.

BIDS ASKED

Ala., Bay Minette — Aug. 6, by State Hy. Comn., Montgomery, 300 ft. concrete bridge over Louisville Ry., eliminating grade crossing, Baldwin Co.

PIERS AND WHARVES

PROPOSED WORK

Calif., Monterey—WHARF—City, wharf repairs, incl. 25 creosoted piles, 175 lin.ft. 3-ply, 4 x 14 in. timber ribbing. F. B. Smith, 58 Sutter St., San Francisco, engr.

N. J., Woodbridge—DOCKS—Port Raritan Dist. Comn., South Amboy, preliminary plans concrete, timber municipal dock. $35,000. S. J. Mason, Runyon St., South Amboy, engr.

AIRPORTS

PROPOSED WORK

Ill., Galesburg—City, c/o S. Nirdlinger, 1st Galesburg Natl. Bank Bldg., airport on 137 acre tract. $50,000. Engineer not selected.

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BIDS ASKED

Mich., Detroit—July 28, by Dpt. P. Wks., 7 in. concrete paving 30,840 sq. yd. for Airport Hangar Apron 2. $50,000. P. A. Fellows, city engr.

CONTRACTS AWARDED

Ia., Iowa City—Boeing Air Transport, Inc., c/o D. B. Colyer, vice pres., Cheyenne, Wyo., 80 x 100 ft. rein.-con., steel hangar, 20 x 100 ft. concrete, brick office building, to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. $40,000.

Tex., Lubbock—City, 1 story, 85x120 ft., rein.-con., brick, steel hangar, to W. G. McMillan, Myrick Bldg., $22,803.

GRAIN ELEVATORS

CONTRACTS AWARDED

Minn., Minneapolis—GRAIN ELEVATOR—Cargill Grain Co., 1100 1st Natl. Soo Line Bldg., 2,000,000 bu. addition to grain elevator, to James Stewart & Co., 343 South Dearborn St., Chicago, Ill.

POWER AND LIGHTING

PROPOSED WORK

Va., Overall—Page Power Co., Luray, applied to State Corporation Comn., for permission to construct hydro-electric development on South Fork Shenandoah River, incl. dam, near here.

CONTRACTS AWARDED

Utah, Salt Lake City — Amer. Telephone & Telegraph Co., 4 mi. underground conduit cable system, North Temple St. to Hyberg Bros. Electric Ry. Bldg., $50,000.

SPORTS AND PARKS

PROPOSED WORK

Calif., Del Monte—Del Monte Properties Co., golf course, steeple chase course, polo fields, roads, cottages, filter system for swimming pool, solarium, hotel additions and renovations. $1,000,000.

Okla., Shawnee—Peyton Jennings preliminary plans swimming pool. $25,000. E. J. Peters, Shawnee, engr.

Pa., Easton—Bd. City Council, park, playground, Wolf St. between 7th and 7th Sts., incl. grading, concrete walks. $50,000. C. A. Reese, City Hall, engr.

CONTRACTS AWARDED

Ariz., Tucson—City, concrete municipal swimming pool, to H. F. Brown, Tucson, $21,700. Est. $25,000.

Mass., Boston—City Park Dpt., 33 Beacon St., 1 story, basement, brick, concrete field house, Columbus Park, South Boston, to F. Losordo Co., 24 School St., $27,615.

HEATING AND VENTILATING

BIDS ASKED

N. J., Bergenfield — July 25, by Bd. Educ., Harding School heating, ventilating, vacuum cleaning, telephone, clock systems at Thomas Jefferson School. $25,000. A. E. Doore, 173 Main St., Hackensack, engr.

N. J., Morris Plains — Dpt. Institutions & Agencies, State Office Bldg., Trenton, taking bids (extended) heating, ventilating systems in main building at State Hospital, Greystone Park. $25,000. Division Architecture & Constr., State Office Bldg., Trenton, engrs.

CONTRACTS AWARDED

N. Y., Bayside—Bd. Educ., 500 Park Ave., New York, heating in P. S. 159, to H. Starkman & Bros., 1482 2nd Ave., New York, $57,620; plumbing, to W. J. Endres, Inc., 31-65 29th St., Long Island City, $19,700; electrical work, to Pyramid Electric Co., $16,800. Grand total $94,120. Noted June 19.

UNCLASSIFIED

PROPOSED WORK

Mass., Malden (br. Boston)—COMFORT STATION—City, W. J. Walsh, City Hall, rejected bids July 7, 1 story, brick, steel, concrete, Huntings Field. $25,000. Will readvertise. C. F. Springall, 50 Park St., Malden, archt. Noted June 26.

Mo., St. Louis—SILOS—Marquette Cement Mfg. Co., R. W. Meyer, local mgr., 1623 Arcade Bldg., taking bids 5 rein.-con. silos for storing cement for distributing plant, foot Malt St. $75,000. Private plans.

Okla., Atoka—NATURAL GAS SYSTEM—Midwestern Gas. Co. granted franchise natural gas distribution system. $50,000. Private plans.

Tex., Jasper — FISH HATCHERY — State Game, Fish & Oyster Comn., Austin, soon takes bids fish hatchery on Indian Creek, incl. 60 to 75 acre dam and form pond, on 200-acre site. 8 mi. west of here. $100,000. Private plans.

BIDS ASKED

Mass., Framingham — CONCRETE WALL — July 28, at Office of Reformatory, concrete wall at reformatory for women, for Commonwealth of Massachusetts, Boston.

N. Y., Rochester—CORRIDORS—Aug. 6, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, connecting corridors, metal partitions, for Building 1, 2 and 3, at Rochester State Hospital.

N. Y., Syracuse—ELEVATOR—Aug. 6, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, electric elevator, dumbwaiter, at Psychiatric Institute and Hospital; adv. E. N.-R. July 24.

CONTRACTS AWARDED

Ariz., Globe — STEEL BIN — Old Dominion Co., I. H. Barkdoll, mgr., 120 ft. steel head frame, 1,500 ton steel storage bin, to El Paso Fdry. & Machine Co., El Paso, Tex., $50,000; cement lining shaft to 2,600 ft. level, installing machinery, by day labor. Total $100,000.

Texas—NATURAL GAS PIPE LINE—Texas Gas Utilities Co., Del Rio, 16.5 mi. 6 in. natural gas pipe line between Ricarde Field and Eagle Pass, to N. A. Saigh Co., 510 Builders Exch. Bldg., San Antonio, $160,000.

MATERIALS

PROPOSED WORK

LIGNIN BINDER—Atlantic City, N. J.—Bd. Freeholders Atlantic Co., Guarantee Trust Bldg., soon takes bids 215,000 gal. lignin binder for application on gravel roads. A. H. Nelson, 741 Guarantee Trust Bldg., engr.

BIDS ASKED

ASPHALT SATURATED FABRIC — Boston, Mass. — July 28, by City Transit Dpt., 100,000 sq.yd. asphalt saturated fabric; 250 tons asphalt; 1,300,000 lb. deformed reinforcing rods.

MOTOR OILS, GRAVEL, etc.—Mississippi—July 28, by State Hy. Comn., Jackson, motor oils, and washed gravel for period extending from July 28, to 1930 to Jan. 25, 1931. C. M. Williamson, dir.

GRAVEL and CRUSHED STONE—Osage City, Mo.—July 26, by Missouri State Penal Bd., at office F. B. Jones, dir., Jefferson City, 100 carloads gravel or crushed stone, for Intermediate Reformatory, about 2 mi. from here.

JOINT FILLER—New York, N. Y.—July 25, by J. Miller, pres. Manhattan Boro, Municipal Bldg., 600 tons asphaltic joint filler.

BROKEN STONE, etc.—St. George, N. Y.—July 30, by J. A. Lynch, pres. Richmond Boro, Boro Hall, 1,000 cu.yd. 1½ in. broken stone 8-8 in Dist. 2; 2,000 cu.yd. 1½ in broken stone 8-8 in Dist. 3; 1,000 tons bituminous concrete in Dists. 1, 2 and 3; 30,000 gal. asphaltic cement; 600 cu.yd. trap rock screenings, 500 cu.yd. pea gravel in Dist. 1.

GRAVEL — Cordell, Okla. — Aug. 4, by R. Glass, clk. Caddo Co., furnishing, hauling 2,000 tons road gravel, Co. Rd. 5. $25,000. F. Ford, Cordell, engr.

Okla., Oklahoma City—CEMENT—July 28, by M. Peshek, city clk., 5 cars Portland cement for Waterworks Dpt. G. F. Brown, City Hall, engr.

CONTRACTS AWARDED

REALITOS LIMESTONE, etc. — Corpus Christi, Tex. — Nueces Co., 62,000 yd. realitos limestone, to R. A. Thompson, Corpus Christi, $107,231; 91,000 yd. mud shell, to Heldenfels Bros., Rockport, $80,512, both f.o.b. Corpus Christi.

EQUIPMENT

BIDS ASKED

STREET SWEEPER—Vallejo, Calif.—City in market motor pick-up street sweeper. T. D. Kilkenny, city engr.

SURFACE HEATER—Long Island City, N. Y.—July 28, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., asphalt surface heater; 2 oil distributors.

FIRE HOSE—McAlester, Okla.—Aug. 11, by H. McDonald, city clk., 1,000 lin.ft. 2½ in. fire hose. $5,000. E. Magoffin, McAlester, engr.

CONTRACTS AWARDED

CRANES—Milwaukee, Wis.—J. W. Nicholson, city purch. agt., 2 electric traveling cranes, to Harnischfeger Corp., 3800 National Ave., $10,976.

Buildings

RESIDENTIAL

BIDS ASKED

Calif., Salinas—A. W. Story, archt., Pajaro Valley Bank Bldg., taking bids 3 story, basement, rein.-con., Monterey St. $150,000.

N. J., Jersey City—F. G. Hasselman & A. J. Zerman, archts., 34 Prospect St., East Orange, bids about Aug. 7, general contract 12 story, basement, 100 x 105 ft., brick, steel, rein.-con., plain found., Gifford Ave. and Hudson Blvd., for Gifford Realty Co., c/o architects. $750,000. Noted July 3.

N. J., Newark—July 29, by F. Grad, archt., 1023 Broad St., 2 story, basement, 100 x 120 ft., brick, steel, rein.-con., plain found., Clinton Ave. and South Bd. St., for Owner, c/o architect. $350,000.

N. J., Passaic—See "Contracts Awarded."

N. J., Paterson—Owner, c/o E. R. Coe, archt., 136 Washington St., or architect, bids about Aug. 15, general or separate contracts, 3 story, basement, 75 x 120 ft., brick, steel incl. apartments, plain found., 1109-1113 Main St. $150,000. Noted July 17.

Pa., Pittsburgh—See "Contracts Awarded."

Buildings—Residential (Continued)

Wis., Milwaukee—Eleventh & Wisconsin Co., 530 Wisconsin Ave., bids about Sept. 1, 15 story, 1st floor 66 x 118 ft. and rest of building 66 x 88 ft., brick, steel, plain found., Wisconsin Ave. $600,000. Keymar & Nack, 1959 Richards St., archts.

CONTRACTS AWARDED

N. J., Passaic—S. Saxe, 365 Main St., 100 x 145 ft. and 120 x 145 ft. apartments, each 3 story, basement, brick, steel, rein.-con., plain founds., Temple Pl. and Main Ave., separate contracts, $180,000. Preiskel & Svarla, 631 Main Ave., archts.

Pa., Pittsburgh—Phillip Goodman (builder), 5743 Beacon St., 6 story, basement, 80 x 135 ft. brick, tile, incl. stores, Beacon and Murray Aves., separate contracts $150,000. A. Sharove, Berger Bldg., archt.

CLUBS

PROPOSED WORK

Conn., Bridgeport — Algonquin Club, 211 State St., brick, steel club house, Harrison and Golden Hill Sts. $150,000. Engineer and architect not selected.

Ia., Dubuque—Masonic Temple Assn., Inc., G. L. Dewey, secy., P. O. Box 165, soon lets contract 4 story, mezzanine, 100 x 159 ft., rein.-con., brick, stone, steel, 12th and Locust Sts. $250,000. R. F. Moore, 415 O. R. C. Bldg., Cedar Rapids, archt. Noted May 1.

BIDS ASKED

Ill., Chicago—Holabird & Root, archts., 333 North Michigan Ave., bids about Aug. 1, 9 story, 165 x 354 ft., brick, Indiana stone international club and dormitories, 57th St. and Dorchester Ave., for University of Chicago, 124 South Michigan Ave. $1,500,000.

N. J., Irvington (br. Newark)—A. M. Kleeman, archt., 987 Springfield Ave., taking bids on separate contracts, 2 story, basement, 60 x 100 ft., brick, steel club, incl. gymnasium, bowling alleys, plain found., 40th St., for Irvington Amateur Athletic Club, 23 Myrtle Ave. $150,000. Noted July 10.

HOSPITALS

PROPOSED WORK

Conn., Hartford—City, A. Batterson, mayor, City Hall, brick, steel hospital and nurses' home, $1,425,000, incl. site and equipment. Engineer and architect not selected.

Ia., Davenport—Schmidt, Garden & Ericksen, archts., 104 South Michigan Ave., Chicago, Ill., soon take bids 6 story, rein.-con., brick, stone side addition, for Mercy Hospital, 2318 Marquette St. $500,000. A. H. Ebeling, Kahl Bldg., assoc. archt.

Mo., Independence—Independence Sanitarium soon takes bids 5 story, basement, 80 x 135 ft., brick, rein.-con. addition, $150,000. H. C. Smith, Auditorium Bldg., archt. Noted Jan. 25.

BIDS ASKED

Ind., South Bend—Bd. Comrs., F. P. Crowe, aud., taking bids and open same about Aug. 1, 2 story, 35 x 212 ft., rein.-con., brick, tile, marble. $150,000. Austin & Shambleau, South Bend, archts.

Mass., Palmer—July 29, by Commonwealth of Massachusetts, Dpt. Mental Diseases, 3 story, basement, brick, steel reception hospital unit at Monson State Hospital. $150,000. Kendall, Taylor & Co., 209 Columbus Ave., Boston, archts.

Mass., Quincy—July 29, by City, T. J. McGrath, mayor, brick, steel hospital addition, $150,000. McLaughlin & Burr, 88 Tremont St., Boston, archts. Noted June 26.

N. Y., Brooklyn — July 28, by J. G. W. Greeff, comr. Dpt. Hospital, Municipal Bldg., New York, isolation pavilion and nurses home, at Kingston Avenue Hospital, Albany Ave. Former bids rejected. Noted June 26.

N. Y., Middletown — Aug. 13, by Commissioner Dpt., Mental Hygiene, State Office Bldg., Albany, addition and altering Ashley Hall, constructing tunnels, Middletown State Homeopathic Hospital; adv. E. N.-R. July 24.

Pa., Cresson—July 30, by State of Pennsylvania, c/o F. St. Clair, engr., in charge, Harrisburg, 2 story, basement, T shaped, 30 x 40 x 80 x 180 ft., concrete, brick, steel, 130 bed childrens unit $300,000. Russell G. Howard, Dep. Natl. Bank Bldg., DuBois, archt.

CONTRACTS AWARDED

Calif., Los Angeles—Bd. Supervs. Los Angeles Co., general contract 2 story, rein.-con. hospital, to Sarver & Sons, 327 West 7th St., $210,434.

CHURCHES

PROPOSED WORK

Me., Fort Fairfield—St. Dennis Roman Catholic Church, J. J. Finn, pastor, sketches by O'Connell & Shaw, 134 Newbury St., Boston, Mass., rebuilding church, destroyed by fire. $150,000.

Mass., New Bedford—South Baptist Church, T. J. Winslade, chn. building com., plans by H. L. Meecham Asso., 120 Front St., Worcester, altering and constructing 1 and 2 story, basement, brick, timber addition, stone found., Brook Ave. $150,000.

Mass., North Adams—St. Anthony's Church, N. J. Mongiello, pastor, 100 Holden St., chapel. $150,000. Engineer and architect not selected.

Mass., Scituate — St. Mary's Church of Nativity, P. J. Buckley, pastor, soon takes bids on revised plans 1 story, basement, 120 x 160 ft., granite, rein.-con., concrete found. $160,000. O'Connell & Shaw, 134 Newbury St., Boston, archt. Noted Mar. 13.

N. J., Dumont—Evangelical Lutheran Church of Our Redeemer, R. W. Heins, pastor, 256 McKinly Ave., sketches by V. Reeser, 55 West 42nd St., New York, 2 story, basement, brick, steel, incl. parish house, plain found., New Milford Ave. $150,000.

N. J., Jersey City—Colored Catholic Church, c/o Fanning & Shaw, archts., 49 Ward St., Paterson, 2 story, basement, 50 x 115 ft., brick, steel, plain found., Forrest St. and Ocean Ave. $150,000. Noted July 17.

N. J., Jersey City — Monumental Baptist Church, W. S. Smith, pastor, 18 Atlantic St., revised plans by J. Armstrong, 36 Gautir Ave., 3 story, basement, 50 x 100 ft., brick, steel, plain, found., Atlantic St. $150,000. Noted May 15.

BIDS ASKED

Conn., Middletown — Methodist Episcopal Parish, J. Dodd, chn. building com., bids about Aug. 1, altering and constructing 1 story, basement, brick, stone Church and parish house addition. $200,000. Woodbury & Stuart, 581 Boylston St., Boston, Mass., and Methodist Bureau of Architects, Methodist Episcopal, City Mission and Church Extension Society, 17th and Arch Sts., Phila., Pa., archts. Noted Apr. 10.

Mass., Framingham — St. Bridgets Roman Catholic Parish, M. J. O'Connor, pastor, 830 Worcester Rd., taking new bids 1 story, basement, brick, stone, plain found., Worcester Rd. and Wheeler Ave. $150,000. E. T. P. Graham, 171 Newbury St., Boston, archt.

Mich., Linden—Aug. 1, by M. H. Wingert, secy. Bd. Educ., 2 story, basement, 61x150 ft., rein.-con., brick, steel, plain found. $150,000. Warren S. Holmes Co., 1555 North Genesee Dr., Lansing, archts.

N. J., Arlington—Myers & Shanley, archts., 24 Walnut St., Newark, bids about Aug. 15, general contract 2 story, basement, brick, steel seminary for Immaculate Conception Seminary. $150,000. Noted June 26.

N. J., Harrison—J. W. Baker, archt., 11 North 4th St., taking bids 3 story, basement, brick, steel rectory, plain found., for Owner, c/o architect. $150,000.

N. J., Jersey City—Fanning & Shaw, archts., 49 Ward St., Paterson, bids about Aug. 15, general contract 2 story, basement, 50 x 115 ft., brick, steel, plain found., Ocean Ave. and Forest St., for Colored Catholic Church, c/o architects. $150,000. Noted July 24.

N. J., Ridgefield Park — July 28, by J. S. Pigott, archt., 42 Walnut St., Newark, general contract 1 story, basement, brick, steel, plain found., Euclid Ave. and Mount Vernon St., for St. Francis Roman Catholic Church, J. J. Butcher, pastor, 114 Mount Vernon St. $250,000. Noted July 3.

R. I., Manville—St. James Roman Catholi Church, F. Desmarais, pastor, taking bids 1 story, basement, brick, stone, concrete, concrete found., Division St. $150,000. W. Fontaine, 285 Main St., Woonsocket, archt.

CONTRACTS AWARDED

N. J., Bogota—A. A. Hayek, archt., English St., Fort Lee, general contract 2 story, basement, brick, steel, to C. Raimondo, 423 Aurora Ave., Grantwood, for Church of Ascension, W. J. White, pastor. Est. $150,000. Noted July 17.

N. J., Highland Park—A. Merchant, archt., 1 Elm Row, New Brunswick, altering and constructing 2 story, basement, brick, steel addition, plain found., to Rogers & Gous Constr. Co., 71 John St., New Brunswick, for Highland Park Baptist Church, c/o architect. Est. $150,000. Noted July 3.

N. J., Verona—N. Hulme, archt., 1524 Chestnut St., Phila., Pa., general contract 2 story, basement, brick, steel, sunday school and social building, plain found., to A. V. Johnson, Forest Rd., Caldwell, for First Presbyterian Church. Est. $150,000. Noted June 12.

SCHOOLS

PROPOSED WORK

Calif., Berkeley—Berkeley City School Dist. Bd. Educ., soon takes bids brick, steel addition to Longfellow School. $150,000. J. W. Plachek, Mercantile Bank Bldg., archt. Noted May 15.

Calif., Pasadena—See "Contracts Awarded."

Calif., Santa Ana—Santa Ana School Dist. plans by Allison & Allison, California Reserve Bldg., Los Angeles, 2 story, rein.-con., 30 class rooms. $150,000.

Conn., Hartford—City, Bd. Educ., sketches by Adams Malmfeldt & Prentice, 15 Lewis St., brick, steel high school, Zion St. and New Britain Ave. $1,000,000. Noted May 29.

Conn., Hartford — Southwest School Dist. sketches by Ebbets & Frid, 15 Lewis St., brick, steel school addition, Monroe St. $150,000.

Conn., West Haven (br. New Haven)—City School Bd., c/o E. J. Grimes, bids early in August, 16-room, brick, steel school, West Main St. $200,000. R. W. Foote, 185 Church St., New Haven, archt. Noted Apr. 17.

Ind., Gary—Bd. Educ. rejected bids July 1 Lew Wallace High School, 3 story, basement, rein.-con., brick, stone, incl. swimming pool, gymnasium, 46th and Madison Sts. $1,000,000. May readvertise soon. W. B. Ittner, Inc., Continental Life Bldg., St. Louis, Mo., archts. Noted June 12.

Mass., Belmont — Town, W. E. Sperry, 350 Common St., school. $150,000. Engineer and architect not selected.

Mass., Lee—Town, C. Miller, supt. schools, soon takes bids 2 story, basement, brick, steel high school. $150,000-$200,000. M. W. Maloney, 23 Pearl St., Springfield, archt.

Mass., Sharon — Town, c/o J. R. Gillespie, chn. building com., school. $150,000. Engineer and architect not selected.

Mass., South Hadley—Town, Building Com., c/o M. J. Maloney, archt., 23 Pearl St., Springfield, sketches 2 story, basement, brick school, Granby Rd. $150,000.

Mass., Townsend — Town, c/o F. J. Piper, Town Hall, brick school, $125,000-$150,000. Engineer and architect not selected.

Mass., Revere—City, Mayors Office, City Hall, sketches by Silverman & Brown, 51 Cornhill, Boston, Junior High School, 2 story, basement, brick, steel, Park Ave. near Bway. To exceed $150,000.

Mass., Wakefield—Town, W. B. Atwell, supt. schools, sketches by J. W. Beal Sons Co., 185 Devonshire St., Boston, 2 story, basement, brick intermediate school. $175,000.

Minn., St. Paul — Bd. Educ., I. C. Pearce, comr., Endicott Bldg., 2 story, basement school, Harrison Ave. and Magnolia St. and constructing addition to school, Marion Ave. and Lawson St., each rein.-con., brick, stone. $200,000. C. A. Bassford, city archt.

Me., Fryeburg — Fryeburg Academy, E. O. LaCasce, Portland, sketches by J. C. and J. H. Stevens, 477 Congress St., Portland, 2 story, basement, brick, steel academy, concrete found. $150,000.

Mo., St. Louis—Bd. Educ., 911 Locust St., sketches 3 rein.-con. brick, stone, high schools in central, northwestern and southwestern sections. $3,000,000. G. W. Sanger, c/o Board, acting building comr.

Mo., St. Louis—St. Liborius Parish, c/o S. H. Kister, pastor, soon lets contract 2 story, basement, 27 x 51 x 77 x 107 x 133 ft. T-shaped, brick, steel, rein.-con., stone school, parish hall, incl. classrooms, auditorium, dining room, kitchen, bowling alleys, ladies' and men's club rooms, North Market and Hogan Sts. H. Dreisoerner, 3828 Arsenal St., archt.

N. J., Kearny (sta. Arlington)—Bd. Educ., Devon St., Junior High School, $250,000; altering and constructing addition to Roosevelt School, Magnolia Ave., $150,000 both 2 story, basement, brick, steel, rein.-con., plain founds. Engineer and architect not selected.

N. J., Linden—Bd. Educ., plans by H. B. Brady, Inc., 333 North Broad St., Elizabeth, Senior High School addition. $380,000.

N. J., Mountain Lakes—Bd. Educ., 2 Hudson Blvd., West Mountain Lakes, 2 story, basement, brick, steel school, plain found. $150,000. Engineer and architect not selected.

N. Y., Arrochar—Sisters of St. John Baptist, Cleveland Pl., St. George, S. I., sketches by De Pace & Juster, 151 West 46th St., New York, 2 story, basement, brick, steel school, dormitory, plain found. $150,000.

N. Y., Syracuse—Contr. & Supply, soon takes bids Bradford Hills School. $1,000,000.

Okla., Tulsa—School Bd. Educ., M. C. Prunty, supt., sketches 3 story, high school building, Red Fork St., West Tulsa. $200,000. Engineer and architect not selected.

Pa., Brentwood—Bd. Educ., plans by E. B. Lee & H. Viehman, Chamber of Commerce Bldg., Pittsburgh, Junior-Senior High School, Brentwood Park. $200,000.

R. I., Providence—City, Dpt. Public Buildings, sketches by T. J. H. Pierce, City Hall, altering and constructing 2 story, basement, brick addition, Broad St. $150,000-$175,000.

Tenn., Nashville—Meharry Medical College, 112 Maple St., plans by Gordon-Kaelber, 311 Alexander St., Rochester, N. Y., several college buildings on present site. $1,000,000.

Tenn., Nashville—Bd. Educ., plans by Marr & Holman, Stahlman Bldg., North Nashville, Junior High School. $150,000 bonds voted for same.

Tex., Rio Grande — Rio Grande City, Ind. School Dist. plans by R. Newall Waters, Security State Bank Bldg., Weslaco, 2 or 3 story, brick, rein.-con. high school, plain found. $110,000-$150,000.

Wis., Waukesha—Bd. Vocational Educ., plans by H. C. Haeuser, 445 Milwaukee St., Milwaukee, 1 and 2 story, 120 x 174 ft., brick vocational school, Maple St.

BIDS ASKED

Calif., Claremont—W. T. Johnson, archt., San Diego Trust & Savings Bldg., San Diego, taking bids Bridges Hall of Music, 2,500 seating capacity, rein.-con., for Claremont College. $650,000. Noted Jan. 9.

Calif., Pasadena—See "Contracts Awarded."

Ind., Lafayette—July 29, by Bd. Trustees Purdue University, Thomas Duncan Memorial, an addition to Electrical Engineering Building, and Franklin Levering Cary Hall, on campus, also underground extension to heating system. $160,000. W. Sholer, Wallace Blk., archt.

Mass., Marlboro — July 28, by E. P. Carr, supt. City Schools, 2 story, 60 x 140 ft., brick, steel, Bigelow St. $150,000. M. A. Dyer, 1 Beacon St., Boston, archt. Noted July 23.

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Schools (Continued)

Mass., Wilmington—J. Hathaway, chn. school comn., taking bids altering and constructing 2 story, basement, brick, stone, steel high school addition, plain found. $200,000. Haynes & Mason, Park Bldg., Fitchburg, archts. Noted June 17.

N. J., Clifton—Bd. Educ., High School, bids about Aug. 15, School 3, 2 story, basement, brick, steel, rein.-con., plain found., Clifton Ave. $250,000. Lee & Hewitt, 152 Market St., Paterson, archts. Noted July 3.

N. J., Irvington (br. Newark)—Bd. Educ., 1253 Clinton Ave., bids about Aug. 15, altering and constructing 2 story, basement, brick, rein.-con., steel, addition, plain found., Grove St. $170,000. Schneider, Kleeman & Werther, 1007 Broad St., Newark, archts. Noted July 3.

N. J., Linden—Bd. Educ., St. George Ave., bids about Sept. 2, 2 story, basement, brick, steel, rein.-con. addition to School 2, plain found., Wood Ave., $150,000. H. B. Brady, Inc., 333 North Broad St., Elizabeth, archts. Noted June 27.

N. J., New Brunswick—Bd. Educ., Livingston Ave., bids about Sept. 2, general contract altering and constructing 2 story, basement, brick, steel, rein.-con., addition to Senior High School, plain found., Livingston Ave. $150,000. A. Merchant, 1 Elm Row, archt. Noted July 3.

N. J., Orange—Bd. Educ., Central Ave., bids about Aug. 1, 2 story, basement, 160 x 195 ft., brick, steel, rein.-con., plain found., Heywood Ave. $200,000. E. Sibley, 1034 Edgewood Lane, Palisade, archt. Noted July 17.

N. J., Perth Amboy—Bd. Educ., 261 State St., bids about Sept. 2, general contract altering and constructing 3 story, basement, brick, steel, rein.-con. addition, plain found., Madison Ave. $150,000. Greisen & Tuzig, 175 Smith St., archts. Noted July 10, under "Bids Asked."

N. J., Ridgewood—Aug. 4, by Bd. Educ., Central Grammar School, West Franklin Ave., general contract altering and constructing 2 story, basement, brick, steel, rein.-con. addition, plain found., East Ridgewood Ave. and Hermonce Pl. $450,000. Fanning & Shaw, 49 Ward St., Paterson, archts. Noted July 3.

N. J., Rutherford—Bd. Educ., High School, bids about Aug. 15, 2 story, basement, brick, steel, rein.-con. addition to Washington School, plain found., Wood St. $150,000. E. I. Williams, 131 West Passaic Ave., archt.

N. Y., Douglaston—July 30, by W. C. Martin, archt. and Supt. School Building, Flatbush Ave. extension and Concord St., Brooklyn, P. S. 98, Douglaston Blvd. near Cedar St., for Bd. Educ., 500 Park Ave., New York.

N. Y., Richmond Hill Circle — July 30, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, addition to P. S. 124, South Conduit and 150th Aves., 129th and 130th Sts., for Bd. Educ., 500 Park Ave., New York.

N. Y., Tuxedo Park—Aug. 5, by Bd. Educ., (from selected list of bidders) general contract G. F. Baker, High and Grade School, 3 story, basement, brick, steel, plain found. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted June 26.

N. D., Fargo—July 28, by Bd. Educ., 2 story, basement, rein-con., brick, 11th St. and 2nd Ave. S. $150,000. W. F. Kurke, Fargo, archt. Noted July 19.

O., Alliance—Bd. Educ. bids about Sept. 7, 2 story, basement, 8-room, brick school, Parkway Blvd. $150,000. Fox, Guthrie & Foose, Union Trust Bldg., Cleveland, engrs. Roller & Simboli, Alliance, archts.

Pa., College Hill (mail Beaver Falls)—July 31, by W. G. Eckles, archt., Lawrence Savings & Trust Bldg., New Castle, 1 story, basement, sandstone, hollow tile, steel truss and concrete library, for Geneva College. $150,000. A. C. Edgecomb, Eng. Dpt., Geneva College, engr.

Pa., Morganza—Aug. 6, by Bd. Comrs. Pennsylvania Training School, 2 cottages for girls, 1 for boys. $200,000. Eric Fisher Wood & Co., 233 Oliver Ave., Pittsburgh, archts. F. St. Clair, North Wing Capitol Bldg., Harrisburg, engr.

R. I., Cumberland (Mail Manville)—July 28, by School Bd., c/o Broderick, 3 story, basement, 80 x 115 ft., brick, stone, steel high school, plain found., $150,000 or more. W. S. Holmes, 155 Noted Genesee Dr., Lansing, archt. Noted July 13.

R. I., Valley Falls—July 28, by Town, R. A. Caldwell, chn. com., 2 story, basement, brick, stone high school, Broad St. $150,000. W. H. Holmes Co., 1555 North Genesee Dr., Lansing, Mich., archt.

CONTRACTS AWARDED

Calif., Pasadena — Pasadena College, North Bresse St., 2 story, 50 x 150 ft. plaster, steel, administration building, day labor, $65,000. Sketches by Marsh, Smith & Powell, 516 Architects Bldg., Los Angeles, dormitories, laboratory, physical, science and library buildings, 1539 East Howard St. Total $500,000.

Me., Hinckley—Goodwill Home Assn., S. W. Hinskley, in charge, 2 story, basement, 50 x 145 ft., brick, steel high school, plain found., to F. A. Rumery Co., 533 Forest St., Portland. Est. $150,000 or more. Noted July 10.

Mass., Springfield—Hebrew Free School Assn., N. E. Goldstein, 103 Bridge St., foundations for 1 and 2 story, 80 x 120 ft., brick, cast stone school, Chestnut St., to Myer Shor, 87 Bond St. Total est. $150,000. Noted July 4, 1929.

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R. I., Pawtucket—City, W. A. Newell, supt. schools, Junior High School, 3 story, basement, brick, concrete, brick, stone, steel, Newport Ave., to Cruise Constr. Co., 19 Dexter St. Est. $500,000. Noted July 3.

R. I., Pawtucket—City, W. A. Newell, supt. Schools, Junior High School with manual training department, brick, steel, Newport Ave., to Cruise Constr. Co., 19 Dexter St., $332,000.

R. I., Providence—City, J. E. Duane, mayor, at Office City Clerk, City Hall, general contract Junior High School, 2 story, basement, brick, steel, stone, plain found., to E. Turgeon, 36 Exchange St. $857,941: heating, to Files Eng. Co., 31 Bourn St., $115,435; plumbing, to M. Hennessy Co., 99 Fountain St., $60,000. Grand total $1,033,376. Noted July 3.

Wis., Phelps—Bd. Educ., 2 story, basement, 82 x 135 ft. high school, and 20 x 33 ft. wing, to Bentley Bros., Inc., 808 South Pierce St., Milwaukee. Sublet contracts for steel, to Milwaukee Bridge Co., 1400 34th St. iron, to Badger Wire & Iron Wks., 25th and Cleveland Sts.; reinforced steel, to Kalman Steel Co., 208 3rd Ave.; millwork, to Grobben Mfg. Co., 600 Natl. Ave., all of Milwaukee.

THEATRES

PROPOSED WORK

Calif., Los Angeles — C. MacQuarrie, 1779 North Highland Ave., sketches 3 story, 60 x 150 ft., incl. studios, dance floor, Highland and Franklin Aves. $185,000. Engineer and architect not selected.

Calif., West Los Angeles (br. Los Angeles)—James Investment Co., plans by P. P. Lewis, 1063 Westwood Blvd., Los Angeles, rein.-con., 2,000 seating capacity, Westwood Village. $300,000. Fox West Coast Theatres, Inc., lessee.

BIDS ASKED

Calif., Los Angeles—S. C. Lee & S. T. Norton, archts., Financial Center Bldg., taking bids Class A, rein.-con., steel, South Bway., for Gumbiner Amusement Enterprises, Inc., Los Angeles. $350,000.

CONTRACTS AWARDED

Calif., Los Angeles — Hollywood-West Coast Theatres, Inc., rein.-con., Livonia Ave. and Pico Blvd., to Beller Constr. Co., 5613 Hollywood Blvd., $250,000.

Calif., Santa Barbara—Fox West Coast Theatres, Inc., Film Exch. Bldg., Los Angeles, Class A, rein.-con., 1,250 seating capacity, to Beller Constr. Co., 6513 Hollywood Blvd., Los Angeles, $300,000. Noted June 5.

BANKS

PROPOSED WORK

Calif., San Francisco—Bank of Italy, Bank of Italy Bldg., plans by H. A. Minton, Bank of Italy Bldg., 10 story, rein.-con., steel, Clay and Montgomery Sts. $250,000.

Mass., Lynn—Equitable Co-Operative Bank, F. W. Nixon, pres., 145 Munroe St., sketches by T. M. James Co., 3 Park St., Boston, brick, steel, Willow and Oxford Sts. $150,000 or more. Noted June 5.

O., Cincinnati—Graham Anderson, Probst & White, archts., Exch. Bldg., Chicago, Ill., soon lets contract 17 story, basement, 60 x 100 ft., rein.-con., brick, steel, plain found., 4th and Walnut Sts., for Fifth-Third Union Trust Co., Walnut St. $2,000,000. Noted Jan. 2.

O., Hamilton—Second National Bank, C. L. Gebhart, pres., 4 story, basement, stone, concrete, plain found., High St. $300,000.

Okla., Oklahoma City—First Natl. & Trust Co., plans by Weary & Alford, 1923 Calumet Ave., Chicago, Ill., 30 story, basement, 140 x 200 ft., brick, steel, incl. offices. $3,000,000. Noted May 1.

BIDS ASKED

N. J., South Orange — Myers & Shanley, archts., 24 Walnut St., Newark, bids about Aug. 1, general contract, altering and constructing 2 story, basement, brick, steel addition, plain found., for South Orange Trust Co., 53 South Orange Ave. $150,000. Noted July 17.

OFFICES

BIDS ASKED

N. J., Jersey City—Wahlgold Realty, Inc., 22 Journal Sq., or J. T. Rowland, Jr., archt., 30 Journal Sq., bids about Aug. 15, general contract 12 story, basement, 75 x 75 irregular ft., brick, rein.-con., steel, incl. stores, plain found. Journal Sq. and Hudson Co. Blvd. $250,000. Noted July 10.

N. J., Woodbridge—A. Wierzbicki, archt., 175 Smith St., Perth Amboy, bids about Sept. 2, general contract 2 story, basement, 40 x 125 ft., brick, steel, incl. stores, plain found., for Owner, c/o architect. $150,000. Noted July 3.

CONTRACTS AWARDED

N. J., Montclair—J. C. Schaeffler, archt., 52 Vanderbilt Ave., New York, general contract 2 story, basement, brick, steel, incl. stores, to Carlson Co., 89 Walnut St., for A. F. Co., c/o architect. Est. $150,000. Noted July 3.

STORES

PROPOSED WORK

Calif., Oakland—I. Weinstein, 1037 Market St., plans by W. Knowles, 1214 Webster St., Class A rein.-con., steel department store, 19th and Bway. Sts. To exceed $150,000.

N. J., Lyndhurst—Owner, c/o P. J. Jossier, archt., 240 Broad Ave., Palisades Park, 2 story, basement, 90 x 100 ft., brick, steel, incl. apartments, plain found. $150,000. Noted July 17.

N. J., Perth Amboy—J. N. Pierson & Son, archt., 198 Jefferson St., rejected bids and revising plans general contract 2 story, basement, brick, steel department store, plain found., Smith St., for Reynolds Bros., 136 Smith St. $150,000. Noted July 3, under "Bids Asked."

BIDS ASKED

N. J., Newark—Myers & Shanley, 24 Walnut St., archts., bids about Aug. 1, general contract, altering and constructing 1 story, basement, 60 x 100 ft., brick, steel addition, plain found., Broad St., for W. W. Oppenheim, Inc., 657 Broad St. $150,000. F. W. Woolworth Co., 661 Broad St., lessee.

CONTRACTS AWARDED

Calif., Los Angeles — S. Malsman, Jewelers Bldg., 2 story, basement, 80 x 150 ft., rein.-con., Wilshire Blvd., to Perkinson Co., Inc., 3977 South Vermont Ave., $150,000.

PUBLIC

PROPOSED WORK

Ind., Hammond—CITY HALL—City plans by Buckley-Skidmore & Wainwright, 611 Hohlman Ave., rein.-con., stone city hall. $400,000.

Mass., Woburn—CITY HALL, etc.—City, P. J. Gallagher, mayor, plans by M. A. Dyer & Co., 1 Beacon St., Boston, city hall, court house and police station, Common St. $250,000. Noted June 19.

Minn., St. Paul—CITY HALL and COURT HOUSE—City, G. Bundlie, mayor, and Advisory Building Comn., Ramsey Co., plans by Ellerbe & Co., 525 Minnesota Bldg., and Holabird & Root, 104 South Michigan Blvd., Chicago, Ill., city hall and court house, on block bounded by 4th, 3rd, Wabasha and St. Peter Sts. $4,000,000.

N. J., Trenton—STATE HOUSE—State House Comn., rejected bids state house addition. $275,000. Will readvertise. J. O. Hunt, 219 East Hanover St., engr. Noted June 12.

R. I., Lincoln—BARRACKS—See "Garages."

BIDS ASKED

Ind., Knightown—HOME—Aug. 14, by Bd. Comrs. Soldiers & Sailors Home girls double dormitory, brick, steel. $150,000. McGuire & Shook, 941 North Meridian St., Indianapolis, archts.

N. J., Rahway—PRISON—July 29, by Dpt. Institutions & Agencies, State Office Bldg., Trenton, 3 story, basement, brick, steel, rein.-con. addition, plain found. $150,000. Division of Architecture & Constr., State Office Bldg., Trenton, archts.

N. J., Raritan — TOWNSHIP HALL — Bd. Council Twp., E. Meeker, mayor, bids about Aug. 15, 3 story, basement, 50 x 125 ft., brick, steel, plain found., Plainfield and Woodbridge Aves. $150,000. A. Merchant, 1 Elm Row, New Brunswick, archt. Noted July 3.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Calif., Los Angeles—MAUSOLEUM—T. W. Bishop, West Oak St., South Pasadena, sketches 43 x 215 ft., rein.-con., Riverside Blvd. $750,000. Engineer and architect not selected.

Mass., Lynn — STATION — Essex Utilities Corp., c/o J. H. Bickford Co., archts., 6 Beacon St., Boston, soon takes bids 2 story, 80 x 200 ft., brick, stone, steel railroad station, incl. stores, plain found., Market St. $350,000. Boston, Revere Beach & Lynn R.R., lessee.

N. J., Paterson—HOME—St. Francis Home, 25 Jackson St., sketches by Lee & Hewitt, 152 Market St., 2 story, basement, brick, steel addition, plain found., Jackson St. $150,000.

N. Y., Buffalo—TERMINAL—Buffalo Produce Exchange, 162 Perry St., soon lets contract terminal, docks, Clinton St. $500,000. George S. Rider Co., Marshall Bldg., Cleveland, O., archts. and engrs. Noted May 22.

N. Y., Pelham Manor — COMMUNITY — Huguenot Memorial Church, Pelham, plans by Allen & Collins, 75 Newbury St., Boston, Mass., community house, Pelhamdale Ave. $150,000 or more.

Pa., Coraopolis—EXCHANGE—Bell Telephone Co. of Pennsylvania, 416 7th Ave., Pittsburgh, plans by J. T. Windrim, 1501 Commonwealth Bldg., Phila., 100 x 110 ft. exchange, Bway. and Pine Alley. $250,000.

BIDS ASKED

Calif., Long Beach—MAUSOLEUM—C. Aldrich., archt., 714 Pacific Southwest Bldg., taking sub-bids Building F, 1 and 2 story, 65x230 ft., rein.-con., bronze, stone, marble, terrazzo, for Angeles Abbey Mausoleum. $500,000. Owner builds.

Calif., Los Angeles — LABORATORY and CAMERA—Universal Pictures Corp., Universal City, taking bids 3 story, 76 x 150 ft. laboratory, and 2 story, 26 x 125 ft., rein.-con., steel, Universal City. $180,000. H. H. Walker, c/o owner, supervs. archt.

Calif., Los Angeles—RESTAURANT—Morgan, Walls & Clements, archts., Van Nuys Bldg., taking bids 2 story, basement, brick, rein.-con., Vine

Buildings—Unclassified (Continued)

St., for Jacob Stern & Son, c/o architect. $200,000 or more.

Mich., Escanaba — EXCHANGE — Smith, Hinchman & Gryls, archts., 800 Marquette Bldg., Detroit, taking bids 3 story, basement, brick, rein.-con., stone, plain found., for Michigan Bell Telephone Co., Cass Ave., Detroit, $200,000. Elevators, boilers, etc.

N. J., Fort Lee—ADMINISTRATION—G. W. Dexter, archt., 201 Main St., bids about Aug. 22, general contract 60 x 120 ft. and 70 x 160 ft., both 2 story, basement, brick, rein.-con., steel administration and combined title dept. buildings, plain founds., Lemoine Ave., for Consolidated Film Industries, Inc., Lemoine Ave. $150,000. Noted July 3 under "Bids Asked."

N. J., Newark — GARAGE, etc. — J. B. Accocella, archt., 9 Clinton St., bids about Sept. 2, general contract 2 story, basement, 100 x 150 ft., brick, steel garage, store, apartment, plain found., for Owner, c/o architect. $150,000.

CONTRACTS AWARDED

Calif., Los Angeles—LABORATORY—Hughes Development Co., 1001 North Orange St., 2 story, 150 x 295 ft., rein.-con., Orange Dr., to Myers Bros., 3407 San Fernando Rd. $200,000. Multicolors Ltd., c/o owners, lessee.

Ia., Cedar Rapids — EXCHANGE — Northwestern Bell Telephone Co., M. H. Morris, mgr., 318 South 2nd St., excavation and footings 3 story, basement, 97x 103 ft., concrete, brick, stone, 623-31 3rd Ave., Est. to T. Stark Co., 118 South 11th St. W. Est. $250,000. Noted Mar. 13.

Wis., Wauwatosa — HOME for BOYS — La Croix & Memmler, archts., 228 3rd St., Milwaukee, general contract 3 story, 50 x 100 ft. home, to K. W. Constr. Co., 416 State St. Noted May 15.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., San Jose—PACKING PLANT—Continental Packing Co., (W. H. Luhrback, San Jose, interested) sketches rein.-con. meat packing plant, Berryessa Rd. $50,000.

Ind., Kendallville — FACTORY — Flint & Walling Co., sketches 60 x 125 ft. brick, steel galvanizing room. $42,000, incl. machinery. Private plans.

Ind., Indianapolis—PLANT—Supreme Oil & Refining Co., 518 North Dela No. 402, plans by Foltz, Osler & Thompson, 704 F. W. Wild Bldg., 99 x 102 ft., rein.-con., brick, steel plant, Ralston and 23rd Sts. $41,000.

Ind., South Bend—PLANT—Willida Dairy Co., 744 North Allen St., plans by W. W. Schneider, South Bend, 64 x 208 ft., brick, steel, rein.-con. found., Loise St. $47,000.

Mass., Great Barrington—PAPER FINISHING PLANT—Rising Paper Co., c/o L. R. Howes, archt., c/o Strathmore Paper Co., West Springfield, 3 story, brick, $100,000.

Mo., St. Louis — PACKING PLANT — A. Glauser, 2130 Market St., soon takes bids 1 story, 52 x 129 ft. cooler building, 1 story, 68 x 150 ft., warehouse, both brick, concrete, 704 South Spring Ave. $75,000. Aegerter & Bailey, 1904 Railway Exch. Bldg., archts. Noted Feb. 27.

Okla., Oklahoma City—OIL REFINERY—Altitude Petroleum Co., Perrine Bldg., 2,000 bbl. oil refinery at east edge city. $250,000. Private plans.

Okla., Sayre — PLANT — Oklahoma Carbon Mfg. Co., carbon black plant. $60,000. F. L. Coogan, Sayre, engr.

Okla., Sayre—PLANT—Westoak Gasoline Co. casinghead gasoline plant near here. $75,000. F. L. Coogan, Sayre, engr.

Pa., Ambridge—MILL—Spang Chalfont & Co., Etna and Ambridge, mill for making pipe by new electric weld process. $2,000,000.

BIDS ASKED

Calif., Livermore—LOADING PLANT—L. H. Nishkian, engr., 525 Market St., San Francisco, taking bids rein.-con. washing, screening, loading plant for gravel and sand, for Kaiser Paving Co., 1522 Latham Square Bldg., Oakland.

Calif., Watsonville—COLD STORAGE PLANT—Gay Eng. Corp., engrs., 2650 Santa Fe Ave., Los Angeles, taking bids rein.-con., Beach Rd., for Apple Growers Cold Storage Assn., $70,000.

Ind., Terre Haute—FACTORY, etc.—Amer. Car Co. taking bids masonry, carpentry and concrete work for 3 story, basement, 180 x 350 ft. factory, 50 x 60 ft. boiler house with equipment, brick, rein.-con. $1,000,000. Private plans.

Mass., Cambridge — FACTORY — F. W. Webster Co., 340 Congress St., Boston, taking bids 4 story, basement, 100 x 200 ft., brick, concrete, plain found., Wadsworth and Hayward Sts. To exceed $40,000. Densmore, LeClear & Robbins, Park Sq. Bldg., Boston, archts.

Mo., Carthage—EXPLOSIVES PLANT—See "Contracts Awarded."

N. J., Harrison — FACTORY — Driver-Harris Co., Middlesex St., bids about Aug. 15, general contract 1 and 2 story, basement, brick, steel, rein.-con., plain found. $250,000. J. A. Finegan, 776 Broad St., Newark, archt. Noted July 10.

N. J., Rutherford—FACTORY—S. Cordo, 23 West Erie Ave., taking bids general and separate contracts 2 story, basement, brick, rein.-con., steel addition, plain found., 23 West Erie Ave. $40,000. F. Pirrone, 104 Midland Ave., Garfield, archt.

N. J., Union City—DAIRY PLANT—G. Willaredt, archt., 411 23rd St., West New York, bids about July 22, general contract altering and constructing 2 story, basement, 28 x 155 ft., brick, steel addition, plain found., New York Ave. and 45th St., for Consumers Dairy Co., 400 45th St. $45,000. Noted July 17.

N. Y., New York—LAUNDRY—July 28, by J. G. W. Greeff, comr. Hospitals, laundry, at Fordham Hospital, Crotona Ave.

N. Y., Ossining—SHOE SHOP—Aug. 21, by Comrs. Corrections, State Office Bldg., Albany, shoe shop, Sing Sing Prison; adv. E. N.-R. July 24.

Pa., Altoona — FACTORY and STORAGE — Keystone Armature Wks., F. J. Skonier, 1814 Union Ave., taking bids 2 story, 50 x 50 ft., concrete, brick, steel, Union Ave. $40,000. D. G. Puderbaugh, Myers Bldg., Altoona, archt.

CONTRACTS AWARDED

Ind., Marion—PLANT—Chronicle Publishing Co., general contract brick, steel, 413 South Washington St., to G. W. Heinzman & Son, Marion. Est. $41,000.

Ind., Richmond—LAUNDRY—Wayne Laundry Co., 59 x 100 ft., rein.-con., stucco, hollow tile, South L St. $43,000. Owner builds.

Ind., South Bend—FACTORY—Bendix Corp., general contract 150 x 400 ft., brick, steel, Bertrand St., to H. G. Christman, South Bend. Est. $100,000.

Md., Curtis Bay—FACTORY and MACHINE SHOP—Commercial Pigments Corp., Curtis Bay, Md., and 230 Park Ave., New York, additional buildings, incl., 70 x 92 ft. machine shop, to United Engineers & Constructors, 112 North Broad St., Phila., Pa., $200,000.

Mass., Everett (br. Boston) — CHEMICAL PLANT—Merrimac Chemical Co., Inc., 148 State St., Boston, general contract, sulphuric acid plant gas contact, Chemical Lane, to Aberthaw Constr. Co., 80 Federal St., Boston. Est. exceeds $50,000.

Minn., Fairmont—FACTORY—Fairmont Railway Motors, Inc., general contract irregular shaped 150 x 300 ft., brick, steel, to Splady & Hangenson, 1022 Plym Bldg., Minneapolis. Est. $100,000.

Mo., Carthage — EXPLOSIVES PLANT — Hercules Powder Co., Wilmington, Del., 9 buildings, company forces, under supervision J. S. Marks, plant supt., and R. K. Hallett, constr. engr., Wilmington, Del. $175,000.

N. J., Passaic—DISTRIBUTING PLANT—C. B. Comstock, engr. and archt., 122 East 42nd St., New York, 2 story, basement, 105 x 115 ft., brick, steel, plain found., to John J. O'Leary Co., 125 Prospect St. Est. $150,000. Noted June 19.

N. J., Paulsboro—DISTRIBUTION—Vacuum Oil Co., 61 Bway., New York, general contract 1 story, basement, 75 x 215 ft., and 1 story, basement, 50 x 120 ft. distribution and automotive buildings, also 1 and 2 story, basement, 40 x 70 ft. laboratory, to Turner Constr. Co., 420 Lexington Ave., New York. Est. $75,000 and $40,000 respectively.

O., Youngstown — FACTORY — Youngstown Printing Co., C. M. Reed, pres., 114 Wick Ave., 1 story, 50 x 200 ft., brick, steel, concrete commercial printing plant, 787 Wick Ave., to Joseph Bucheit & Sons Co., 100 East Rayen St., $40,000.

R. I., Auburn—MILL—Universal Winding Co., 3 story, 60x120 ft., brick, steel, to Bowerman Bros., 70 Bath St., Providence. Est. $150,000. Noted July 17.

W. Va., New Cumberland—POTTERY FACTORY—Cronin China Co., 1 story, brick addition. $40,000. Owner builds. **Maturity in August.** Private plans.

GARAGES

PROPOSED WORK

R. I., Lincoln—Dpt. State Police, Providence, sketches by Jackson, Robertson & Adams, Turks Head Bldg., Providence, 1 story garage, barracks. $75,000.

BIDS ASKED

Pa., Edgewood—Richard Irvin & Co., archts., Vandergrift Bldg., Pittsburgh, taking bids 1 story, brick super service station, Braddock St. and Hutchinson Ave., for W. W. Gauerman, c/o architects. $40,000.

CONTRACTS AWARDED

Ind., Indianapolis—Crown Hill Cemetery, general contract 30 x 140 ft., brick, steel service building, to Capitol Eng. Co. & Constr. Co., 254 North Capitol Ave. Est. $46,000.

Mass., Attleboro—S. H. Stone, c/o Eden Co., South Main St., 1 story, basement, irregular sized, concrete, steel, brick service garage, store, plain found., Railroad Ave., to A. Young, Attleboro. Est. $40,000.

Mass., Springfield—Connecticut Valley Realty Co., A. Robinson, 134 Chestnut St., 2 and 3 story, 125 x 175 ft., brick, steel, concrete service garage and sales room, plain found., to F. T. Ley & Co., Inc., 1215 Main St., Springfield, and 20 Providence St., Boston. To exceed $40,000.

R. I., Providence—Providence Auto Equipment Co., F. Kellogg, 69 Mathewson St., altering and constructing 1 story addition to service station, Fountaine and Franklin Sts., to O. D. Purington & Co., 49 Weybosset St. Est. $40,000.

Wis., Milwaukee — La Croix & Memmler, archts., 228 3rd St., excavation, concrete and masonry contracts for 1 story, basement, 60 x 65 x 74 x 92 ft., brick, concrete, structural steel garage, showroom, to G. Nadler, 704 14th St. Noted May 15.

SHOPS AND FOUNDRIES

PROPOSED WORK

N. Y., Brooklyn—IRON FOUNDRY—Lee & Hewitt, archts., 152 Market St., Paterson, N. J., soon let general contract 2 story, basement, brick, steel, plain found., 263 Scholes St., for Brooklyn Brass Wks., 263 Scholes St. $40,000. Noted June 12.

BIDS ASKED

N. J., Fort Lee — MACHINE SHOP — G. Dexter, archt., 201 Main St., bids about Aug. 15, general contract 1 story, basement, 25 x 240 ft. machine shop, and 1 story, basement, 20 x 200 ft. shipping building, brick, steel, plain founds., Lemoine Ave., for Consolidated Film Industries, Inc., Lemoine Ave. $75,000. Noted July 3 under "Bids Asked."

N. Y., Newark—SHOP—Aug. 13, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, shop building at Newark State School for Mental Defectives; adv. E. N.-R. July 24.

CONTRACTS AWARDED

Md., Curtis Bay—MACHINE SHOP—See "Factories and Mills."

Wis., Cedar Grove — FOUNDRY — R. J. Schwab & Sons Co., roofing and sidewalks, foundry addition, to Edmund Marliere, La Salle Natl. Bank Bldg., La Salle, and 205 West Wacker Dr., Chicago, Ill. This corrects report in July 10 issue.

POWER PLANTS

PROPOSED WORK

S. D., Pierre—City soon takes bids power plant addition, incl. two 600-hp. Diesel engines, $125,000 voted for same. R. Baker, city engr.

BIDS ASKED

Mass., North Andover—Meadowbrook Laundry Co., taking bids 1 story, brick, steel power house, plain found. $40,000. H. Petzold, Bay State Bldg., Lawrence, archt.

Mich., Northville—July 28, by Bd. Comrs. Detroit House of Correction, 1441 Alfred St., Detroit, boilers, boiler setting, boiler feed water heater, stokers, boiler breeching, radial brick stack for power house, Albert Kahn, 1000 Marquette Bldg., Detroit, engr.

O., Cleveland—July 25, by City, furnishing stoker, platform scale, coal and ash handling equipment for boiler house at City Infirmary, F. H. Cover, City Hall, engr.

Pa., Pittsburgh—Atlantic Refining Co., W. J. Patterson, sales mgr., Pittsburgh Dist., 5733 Sutler St., taking bids 2 story, 44 x 77 ft., brick, steel, 5732 Butler St. $40,000. W. Samons, 3144 Passyunk Ave., Phila., engr.

CONTRACTS AWARDED

Ind., East Chicago — Northern Indiana Pub. Serv. Co., general contract 2 story, 35 x 75 ft. and 1 story 30 x 60 ft., rein.-con., brick, power sub-station, to H. B. Olney, 1200 East Chicago Ave. Est. $75,000.

Ind., Indianapolis — Indianapolis Power & Light Co., N. Perry, pres., 48 Monument Circle, super power plant, between Harding and South Mountain River, 1 mi. south of Troy Ave., also 45 mi. high tension steel towers. $12,267,075. Owner builds.

Miss., Oxford — Mississippi Building Comn., Jackson, W. C. Trotter, secy., temporary steam power plant, incl. 2 boilers, boiler house equipment, steam tunnels, piping, sewers, sewage disposal plant, to A. B. Hayden, Inc., Pass Christian, $70,650. Noted July 12.

Wash., Tacoma—Bd. Contr. & Awards, steel superstructure for Municipal Power Plant 2, on Lake Cushman Power Project on southwest side of Hylebos Waterway, to O. F. Larson, Tacoma, $41,822.

WAREHOUSES

PROPOSED WORK

Calif., Stockton—Pacific Gas & Electric Co., 245 Market St., San Francisco, sketches warehouse, 100 x 150 ft. garage, shop buildings, storage sheds, warehouse, Church and Center Sts. $500,000. Private plans.

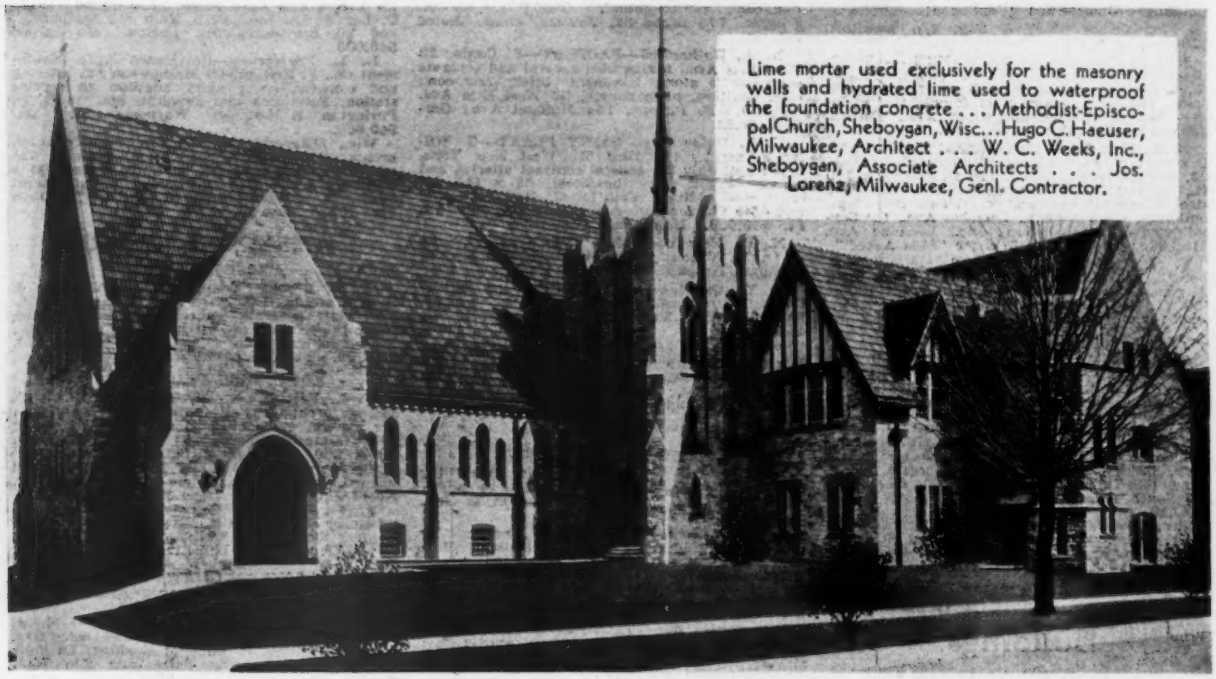
CONTRACTS AWARDED

Ill., Chicago—A. Epstein, archt., 2001 West Pershing Rd., general contract 1 story, 125 x 242 ft., brick, to Voghtborg Constr. Co., 251 West 79th St., for Edgar T. Wards Sons Co., 1455 West 37th St. $1,000,000. Noted June 1.

Utah—Salt Lake City — Utah Wholesale Grocery Co., 375 West 2nd St., S., J. Chester Deal, mgr., 2 story, warehouse, to Ryberg-Sorenson Co., Electric Ry. Bldg., $75,000. Noted June 19.

See proposal advertising on page 109

Constr. News page 39



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